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FILM PHOTOGRAPHY



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FILM PHOTOGRAPHY

The stream of progress makes strange windings, ever and again doubling upon itself in many a crooked course. In film photography — by which we mean the making of negatives on flexible supports instead of on glass plates — we revert to the ideals of the dead and gone enthusiasts of the forties, with whom photography began. For film photography is no new thing, but most ancient in camera-craft; simply an old dream come true after many years. Daguerre, to be sure, used plates of silver and silvered copper as the support for his marvelous picture images. But Fox Talbot, the true father of photography as it is done today, prepared his earliest negatives on paper (1839). So the first photographic negatives were in truth film negatives, i.e., negatives made on flexible supports. To what perfection Talbot's invention was brought may be seen in Scandlin's collection of Victor Prevost's negatives of New York and vicinity, dated 1851-54, wherein we have waxed paper negatives as large as $15\frac{1}{2} \times 18$ inches, rivaling in technical quality the film work of our own time. The use of glass as a support for the sensitive film was an afterthought, heralded as the beginning of a new era in photography. It was Herschel, I believe, who by patient experiment first persuaded the fragile film of silver chloride to rest securely on a glass plate. Thus the way was prepared for the wet collodion process, which afterward supplanted the "excited photogenic paper" with which Talbot and his co-workers had "excited" the world.

How different the film photography of those early

days from that with which we are familiar today! Things have been wonderfully simplified. The hour's exposure needed then has become the fraction of a second. The single sensitive film, laboriously prepared as required, has given way to the film cartridge holding a strip of sensitive film sufficient for a dozen or more exposures. The making of a film negative, instead of being encumbered with a score of delicate operations puzzling the skilled chemist, is well within the grasp of the average man or woman after half an hour's instruction. More than this: the children in our schools get their first glimpse of photography from that magic scroll of sensitive film which marks the latest advance in photographic manipulation.

All this, so simple in the telling, is the outcome of years of laborious experiment and continual failure. Only within the past fifteen years, indeed, has film photography been made a practical method, capable of meeting the requirements of everyday work with the camera. And there is still a great deal to be learned about it. Especially is it desirable that we should review the progress of photography with films, and get a wider and more intelligent understanding of its difficulties and possibilities. Wherefore this little book is written as a help in the world's work—the first treatise in English upon the subject. If I can but transfer to its pages something of that interest found in the actual practice of film photography, there can be no doubt about its helpfulness. Like all other first books, however, it will be chiefly useful as providing a basis for profitable discussion.

The word film is used in photography to describe two entirely different things. What are Films? The oldest and most general use describes the layer, coating or film of gelatine, albumen, etc., upon some support. Thus we speak of the film side of a plate or print. The later use, and one arbitrarily adopted in photographic technology, describes a flexibly supported layer of sensitive material, i. e., the word film used in this sense includes both the celluloid, paper or other support *and* the film of emulsion spread upon it. There need be no confusion in

the use of the word when once this distinction has been grasped. In other languages the difficulty does not arise. Thus the Germans use "schicht" to express the earlier sense, adopting the foreign word "film" for what it expresses in the title of this monograph.

Varieties of Films Let us first acquaint ourselves with a list of the different kinds of film now obtainable. This will indicate the present position of film photography and, at the same time, give us the scope of our excursion in these pages.

1. Cut or flat celluloid films, on celluloid of various thicknesses, but always sufficiently stiff to give rigidity in sizes from 8x10 inches down.
2. Rollable celluloid film, much thinner than cut film, and adapted for use rolled on a spool.
3. Stripping films, cut and rollable, consisting of gelatine emulsion coated on paper from which base it is afterwards stripped, giving a clear gelatine film.
4. Gelatine films, cut and rollable, consisting of an emulsion coated on a transparent gelatine film.
5. Paper film, sometimes spoken of as negative paper : gelatine emulsion on a thin, tough and practically grainless paper support which is afterwards used with or without being made translucent, as the negative.
6. Sandell film, mentioned by name as different from all other varieties in that it consists of two emulsions of different speed coated one upon the other, the film so obtained being sufficiently strong and rigid for use as cut or rollable film without need of other support.

All the varieties of film here mentioned are readily obtainable in Great Britain. In America, owing to a deplorable lack of enterprise, there are at present available two brands of cut celluloid film, one brand of rollable celluloid film, and a single brand of paper film or negative paper. In these pages, of course, we will deal with everything obtainable.

Advantages of Films There is little need to enlarge on this detail, about which plate manufacturers seem to be unreasonably sensitive. The advantages of a light, bulkless and non-fragile support

for the sensitive emulsion are obvious, but these advantages do not apply in all circumstances or under all conditions. Films weigh considerably less than glass plates, and occupy about one-quarter the bulk of any given number of plates. It would be folly to deny the advantages here offered for all photographic work done away from the studio or home. Films are unbreakable, although the thinner rollable varieties can be creased or folded by careless packing. Usually, however, films are less liable to be damaged than plates in storage or transportation. They are easily sent by mail, which provides a simple means of getting rid of exposures when traveling, or obtaining supplies of fresh films at various points on one's journeys. The practical saving of time and labor offered by the daylight changing systems now applicable to cut as well as rollable films requires no emphasis. With the cartridge system in use, it is possible to carry material for a hundred exposures in one's pocket, and change from exposed to unexposed spools of film in open sunlight. Then again, films offer practical immunity from the troublesome defect halation, which, as we know, is due to the reflection of light into the exposed film from the back of the glass plate when plates are used. The thinness of films also permits us to print from either side at will, a decided advantage in making prints in carbon and in printing in clouds. Finally, films are easily stored and occupy very little space. Those who groan under an accumulation of precious negatives on glass plates will appreciate this point.

Disadvantages of Films The disadvantages peculiar to films, although perhaps not so obvious as the advantages, are not far to seek. "Every rose hath its thorns," says the ancient proverb. No film at present obtainable can equal our most rapid plates in speed. The reason is plain and shows that the disadvantage may be removed in due time. Celluloid, paper, etc., are not perfectly inert supports such as glass has proved to be. Hence it has thus far proved impracticable (or risky) to coat flexible supports with ultra-rapid emulsions, because of the liability of deterioration. Of course, this has been

vigorously denied, but experience has shown the fact to be as stated. A sensitive gelatine emulsion is a very delicately balanced chemical combination. The slightest impulse of light, and sometimes mere pressure, will disturb its equilibrium and result in decomposition. Therefore we have to content ourselves with emulsions of a speed not affected by the flexible support. At the same time the tables of plate speeds and experience tell us that the films of today are sufficiently rapid for every reasonable requirement.

Some films (all celluloid films) are inflammable and sometimes brittle in their composition. The risks here involved, however, hardly counterbalance the fragility of the glass plate, and there are unflammable and unbreakable films. It is also said that the use of films in the tropics and at sea presents practical difficulties. Lacking experience, I do not doubt the assertion. Tropical conditions play havoc with the majority of men and things. Why should films be exempt? But an examination of much correspondence on this point does not show that films are any more liable to deteriorate under such conditions than plates. There is certainly no doubt about the wisdom of exercising every possible care in the preservation and use of films and other sensitive material under tropical conditions. The difficulties formerly attending the handling of films have largely been obviated by improvements in their manufacture. This applies especially to the tendency of films to curl, to dry unevenly or to cockle in drying. In chemical manipulations the rigid and reasonably thick glass plate will always be easier to manage than any variety of flexible film can be. Cut films offer little or no difficulty, and rollable films are not more awkward in manipulation than bromide paper. Then we have special "handles" and "film-carriers." At the same time there is truth in the phrase: Films for the field; plates for printing and the dark-room. We must balance the disadvantages with the advantages. It is often argued against negative paper that the grain of the paper is troublesome. This can be overcome by waxing or oiling the support, and so rendering it more perfectly transparent. The greater cost

of films as compared with the cost of plates is not so easily accounted for. With an increased demand and the entry of new varieties of film upon the market, the price of the product will undoubtedly become less formidable than it is today.

The use of celluloid as a support in Celluloid film photography has become so general that it may be worth while to know something about this material from the photographic point of view. The honors of the invention of celluloid are divided between England and America. In 1855 Alexander Parkes, of Birmingham, patented the preparation of a substance made from nitro-cellulose and camphor. It was left to Hyatt, of Newark, New Jersey, to exploit the material successfully in 1869. Whether his was an independent invention I cannot say, but Newark is today the center of celluloid industry.

Celluloid is a hard, durable substance, almost entirely unaffected by acids or alkalies, unchangeable under ordinary atmospheric conditions and very tough. It is rendered plastic by heat, and can be molded into any desired form. Alcohol, acetic acid, and amyl acetate will act upon it and dissolve it. Dissolved in amyl acetate, celluloid forms a capital transparent varnish. This application is, I believe, patented.

The manufacture of celluloid sheets As a Base for used in preparing negative films is some-
Cut Film what as follows: A pile of pure white paper is acted upon by nitric and sulphuric acids, converting it into a mass of nitro-cellulose. This is washed to free it from the acids and then treated with wood alcohol and camphor, producing a jelly-like block, which is then subjected to great pressure, sustained for several weeks. The block, from which most of the alcohol has now evaporated, is put into a machine something like a planing machine, and is cut into shavings or sheets of the thickness of the film desired, usually one-hundredth of an inch. These sheets, measuring 20 x 50 inches, are hung up to dry for a period of three months in order to thoroughly season the material, and so prevent any after change. Each sheet is then taken and rolled under heavy pressure between heated metal plates in order to

obliterate the marks of the cutting knife. These metal plates are either smooth or slightly grained, according to the surface desired in the film, the polished plate yielding a smooth film, and the grained plate a film with matt surface. Both kinds are used, but the smooth is generally preferred as the matt surface film takes a little longer to print, and seems to be more easily scratched. The matt surface, however, offers decided advantage where retouching or handwork is desired on the negative. The sensitive emulsion is spread over these sheets by means of special appliances, insuring a film uniform in thickness. The emulsion is, of course, identical with that used for coating glass plates, and the film when dry is identical with the familiar dry plate of the stores except that the support is celluloid instead of glass.

The manufacture of rollable celluloid Making "Roll Film" film is conducted on the same general principles, except that a long, wide strip is made in place of the block already mentioned. Some years ago Mr. T. H. Blair briefly outlined the manufacture of Blair films as follows:

The base or the basic film taking the place of glass is formed by spreading the liquid material on an endless moving surface, for instance a cylinder, and allowing this material, which is formed into the basic film, to remain on this surface only sufficient time to become solid enough to be handled by the machinery without injury. It is then stripped and kept in motion over rollers, thus allowing the air to be passed over both surfaces equally until sufficiently seasoned, then carried to the coating machine in the non-actinic department where the sensitive emulsion is applied, and the completed film is arranged on the devices which still expose both sides of the film until the drying of the sensitive emulsion is completed.

Thus it will be seen that from the time the basic film leaves the moving surface until the completed sensitive film is finally cut into proper widths and lengths, and wound or put in cut sheet packages, the air has constant access to both sides, and the time of seasoning the basic film before coating can be prolonged to any

extent desirable by extending the area over which it travels, while as this process is carried on in compartments used for no other purposes, the temperature within them can be kept at any desired degree of heat and the air changed by propellers as often as necessary.

It is surprising to note the great difference actual tests have shown in the time required to season by this method compared with that of drying where no direct current can be brought into contact with the surfaces, even in a well-ventilated room. When the film is hermetically in contact with a non-conductor of heat and air, the difference in time is added to many fold. It will be seen that by this process basic film could be made of any length (even miles), and that the relation of the two processes is similar to that of forming fabrics in frames and that of weaving by modern looms. The "ground-glass" surface of Blair's film is not produced by sand-blasting the basic film itself, as is generally supposed (which would be not only an expensive but dusty and dangerous process), but by giving the traveling surface on which the film is formed a fine grain surface, which is reproduced on the film, and, once prepared, goes on giving the impression to miles of film without additional cost, labor or dirt. As to the keeping qualities of film properly made, and with all damaging properties removed from the base, compared with glass plates, everything seems in favor of film, as the chief destroyer of the sensitive coating of emulsion is moist or impure air.

With plates the non-flexibility of the support makes it unsafe to pack the surfaces together, and even when so packed the air is not kept from the surface, while even with cut sheet films it is almost entirely so, the flexibility of the support causing the sheets to be in quite perfect contact. With film in rolls, the surfaces are practically sealed from air and light, and a roll of film as wound by the manufacturers, with box and wrapping removed, can, as we know, be removed from or placed in the camera by daylight without the sensitive film being affected.

It is written somewhere that the celluloid base film

used by the Eastman Company for their cartridge film is only $\frac{1}{400}$ of an inch in thickness.

The first use of celluloid in photography was made in America by John Carbutt, of Philadelphia, whose cut celluloid films are today acknowledged to be among the best of their class. Mr. Thomas Bolas tells me that he received an excellent film negative from Mr. Carbutt in 1884. In November, 1888, Mr. Carbutt communicated to the Franklin Institute the results of four years' experiments looking to the production of a practical celluloid film, as a substitute for the dry plate. The communication was published in "The Philadelphia Photographer," Vol. XXV, 725, and contains many interesting references to earlier attempts to manufacture flexible supports for photographic purposes.

To recapitulate these attempts would call for more history than is desirable here. One or two important items should, however, be mentioned. As already related, the first film negatives were made on paper by Talbot. Later Le Gray introduced his wax-paper process, with which completely successful results were obtained even in negatives of considerable size. In 1868, Dawson, of London, published a method of producing a transparent, flexible supporting film which might be used as a support for a sensitive emulsion. This was apparently the first practical transparent film, and was used in cut sheets or in several sheets joined together in Melhuish's roller-slide which, published in 1856, was the pioneer of the modern "roll-holder."

In 1880, Ferrier, of Paris, patented a compound film of gelatine and collodion; Palmer, of Liverpool, proposed, in 1881, a film of gelatine and ox-gall, with a second film of gelatine. About the same time Stebbing, of Paris, produced gelatine bromide films supported on a hardened gelatine skin; and Warnerke, of London, produced films made of alternate layers of rubber and collodion. Pumphrey, of Birmingham, as early as 1882, made films on a paper base. Later he introduced his "flexible glass" films supported on a collodion base which, in turn, was made sufficiently rigid for handling

by being attached to an adhesive slab. When finished, the film negative was stripped from its rigid support.

In 1884 W.T. Morgan (afterwards Morgan & Kidd), of Richmond, Eng., placed a negative paper on the market. This was remarkably successful, but the grain of the paper was against the popularity of the film. About 1885 the Vergara film appeared, the invention of the late Walter B. Woodbury and his partner Mr. Vergara. This film, on a transparent paper, was later replaced by a film supported on translucent bichromated gelatine. The Eastman Company followed during 1885 with a negative paper, and later with the Eastman stripping film. This film, which was much in favor, consisted of a layer of sensitive insoluble gelatine supported by paper coated with a thick film of soluble gelatine. After exposure and development in the usual way, the film was squeegeed face down on to a glass plate coated with rubber solution, allowed to dry, then placed in hot water. Here the soluble gelatine softened, permitting the removal of the paper backing, and leaving the film adhering to the temporary glass support. A "skin" of gelatine was now moistened and squeegeed upon the negative film. After drying, the two films now in perfect contact, were stripped from the glass support as a fairly stiff transparent film. Excellent results were had with this film, but the loss of negatives in transferring and stripping caused its abandonment on the introduction of the Eastman celluloid rollable film now in general use in the unnumbered hosts of Kodaks.

Other bygone films might be mentioned, but they failed in one respect or another and so need not detain us from our subject further.

As films themselves are an old invention, so we can hardly look for novelty in the means adopted for their use in the camera. How the early photographers exposed their paper films in the camera seems to have escaped record. It is probable that they fastened the sheets of sensitized paper between plates of glass, or temporarily fixed them to cardboard supports. We cannot otherwise account for their success in keeping

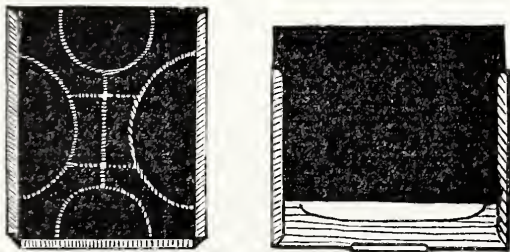
Devices for
Carrying
Cut Films

large sheets of paper perfectly flat during exposure. Later, special forms of "slides" or paper holders were devised, similar to those now used for plates, but much lighter in construction. Many varieties of cut films were accompanied on their introduction by special "slides" adapted to their use. I cannot, at this moment, recall any special holder for films in cut sizes on the American market, but there are two or three in England, such as the Edwards' and Tylar film-slides.

In the Duplex slide (Stanley's patent), made by the Sandell Films and Plates Company the film is doubled over a sheet of ebonite which thus separates the two sensitive surfaces and the double film is pushed into an ebonite case resembling an ordinary plate-holder or dark slide. After exposure, the films are removed by withdrawing the separating plate whilst slightly pressing upon one side of it.

The Edwards holder is a metal plate-holder, but specially slim—only a quarter of an inch thick. It takes two thin glass plates or two cut films each in a metal sheath.

The general use of plate cameras has, however, led several manufacturers to introduce convenient "carriers" by which cut films can be used in the ordinary



FIGS. 1 and 2

plate-holder. This is usually a flat sheet or frame of metal (Figs. 1 and 2) having three edges turned over to form a groove into which the cut film slides and is held securely. These carriers have the same thickness as an

average plate. In America we have Carbutt's aluminum film sheaths and the Snappa film-carrier, both of which I have found satisfactory in use. In England the Thornton-Pickard carrier will be found equally useful. In the English "dark-slide" or holder of book-form a piece of stout card will usually serve to support films of less than 5 x 7 inches.

**Daylight
Changing
System for
Flat Films**

As these pages are being prepared for press, announcement is made of a new daylight changing system for cut films. This useful invention, known as the "Rajar" changer, has been so long desired that I am tempted to describe it here, although it is not yet in the market. I quote the manufacturers' specifications:

"The apparatus will be made of the same size and shape as the plate-holders in ordinary use, and is loaded in daylight with a separate case containing ten flat films, after which the apparatus is placed in the camera in the same way as a plate-holder. To make an exposure a sliding part of the apparatus is drawn out and is then pushed back again. These movements have withdrawn one of the films from the tin case and placed it opposite the lens. The exposure is then made in the usual way. After exposure the sliding part of the apparatus is again drawn out, and returned when the exposed film is replaced in the same case. (If required, the apparatus may now be removed from the camera, as all the films are protected from light.) The whole of the films can be changed in this manner, when the case containing the exposed films can be taken out and replaced with another tin case of fresh films, all the operations being done in daylight. The whole of these operations are simple to perform and the changing system certain in action.

"To use the apparatus: Draw out the sliding portion of the changer as far as it will come, and return it to its original position. The film is now ready for exposure. After exposure again draw out the sliding portion of the changer and return the same to its original position. The exposed film is now removed.

"As the film is returned to the original case after

each exposure, the apparatus can be removed from the camera at any time when it is desired to use the focusing screen. The system is thus equally useful for hand- and stand-cameras.

"An indicator shows clearly the number of films exposed and whether a film is opposite the lens or not. A film cannot be exposed twice, and when the whole of the films in the case have been used, the changer automatically locks itself.

"When the whole of the films have been exposed, or should it be required to unload the changer, the case containing the films is automatically closed, and it can be removed in sunlight without any danger of fog. A new case of films can then be substituted and exposed as before. This can be done as often as desired, and any number of pictures taken, without the necessity of using a dark-room, changing-bag or any other apparatus."

This invention is controlled by the Brooks-Watson Daylight Camera Co., of Liverpool. I am glad to know that there is a probability of its being placed on the American market before the present season closes.

Another specialty of the same kind has just been placed on the English market by Geo. Houghton & Sons, of London, and is likely to be introduced on this side of the Atlantic. This a hand-camera which provides a simple arrangement for the changing of cut films in daylight. The instrument, already obtainable in several sizes, appears to be as effective as it is simple in its changing apparatus, and should give an impetus to the use of cut films.

The use of rollable film in the camera necessitates a film-holder of special construction, quite different from the familiar plate-holder or dark-slide. These are known as roller-slides, roll-holders, cartridge roll-holders or cartridge systems, according to their individual form. The essential feature of all of them is a device for unrolling a strip of sensitive film from its roller or spool, stretching the unrolled portion behind the lens in the camera, and after exposure rewinding the exposed portion of film upon a second

Roller-Slides:
Roll-Holders:
Cartridge
System

roller or spool provided within the roll-holder. When first introduced, the roller-slide, as it was called, was a separate attachment, and could be fitted to any camera of suitable size. Such holders (yet in use) are "loaded" or charged with film in the dark-room, just as we fill our plate-holders. The introduction of a protected or lightproof roll of sensitive film, known as a "cartridge" or "daylight changing" film has changed this, and the cartridge permits us to charge our cameras with unexposed film in daylight without fear of spoiling the film by light exposure.

Since the introduction of the cartridge system the roll-holder as a separate attachment has practically been abandoned, the film-carrying and exposing device being built into the body of the camera. Such cameras can, of course, be used with cartridge films only. Some of them, however, are fitted with a separate "back" or attachment permitting the use of cut films or plates as may be desired. Similarly, the older forms of roll-holders are disappearing, being replaced by the cartridge roll-holder which takes cartridge films and can be "loaded" in daylight. It is difficult to imagine further improvement on the present Eastman system of photography with cartridge films, as far as the film-carrying and exposing mechanism is concerned, and great praise is due to the enterprise with which this firm has developed the possibilities of roller-film apparatus. That there will be improvements upon the present rollable film we cannot question, but in what direction it is not so easy to forecast unless the Cristoid films of Sandell point the way to a perfect film without any support.

It must not be supposed that the roller-slide or roll-holder is something belonging to our day. As a matter of fact, the first roller-slide is almost fifty years old, a patent for an apparatus for taking "a series of photographs in succession upon a long strip of sensitive material" having been granted to Spencer & Melhuish, in 1854. Roller-slides were afterward used by a Captain Barr in India, T. E. Merritt in England, and also (in 1875) by Leon Warnerke, to whom is generally ascribed the honor of introducing the first practical

roller-slide for general use. His invention bears a remarkable likeness to the roller slide described by Melhuish in 1856, but I reprint an extract from Warnerke's specifications simply to show how much alike are the roll-holders of twenty-seven years ago and those in use today.

Warnerke's
Roller Slide
1875

Mr. Warnerke describes his roll-holder as follows: "The principal components of the new dark slide are two rollers on which the sensitive film is wound, and there is room for a hundred exposures. A darkened glass plate is fixed in the front in the place corresponding with the focusing surface: this glass plate guides the sensitive film in the progress from one roller to the other and secures its proper position. Each roller has a metallic head by which it can be put in motion. By means of these heads all the ribbon of sensitive film can be consecutively drawn from one roller and, after exposure, rewound on another roller. But to secure perfect flatness there is attached to each head a pressing screw, that arrangement permitting the stretching of the film when in position. Before the sensitive film is attached to the roller, it is divided into sections corresponding with the size of the plates by black lines drawn in pencil or otherwise and each section is numbered. In the sliding shutter there is a little window secured with orange glass and spring metallic shutter. Through this orange glass window I am able to observe the black lines forming the divisions between each section of film, and their corresponding numbers. This permits me to judge of the correct position of each consecutive section."

Barr's
Daylight Spool
and Others

The daylight changing system of spool films is likewise ancient, for it is described by Captain Barr in connection with the roller-slide mentioned above. Says Captain Barr: "As a further precaution against light and to guard against the evil effects of the air upon the prepared paper, I leave the black calico band a foot longer than is necessary to carry all the sensitive paper, so that when all are wound around the roller the last five or six plies are plain black calico, thus excluding

all light." Mr. Thomas Bolas tells me that for many years he believed himself the inventor of the daylight spool until he came across Barr's publication, and he has since learned that Sir Henry Trueman Wood likewise independently suggested the same device.

With this general knowledge of films we can now profitably discuss them in detail, beginning with the use of cut films as the simplest introduction to the practice of film photography.

By cut films, or flat films as they are sometimes called, we mean sensitive films cut to standard sizes for use in ordinary plate-holders, film-slides or the metal sheaths of magazine cameras. Because of their thinness and flexibility cut films are rarely used in sizes larger than 8 x 10 inches. They are usually obtainable from dealers in photographic supplies, but the concentration of publicity on the selling of plates and roll films makes it sometimes difficult to find cut films in the regular stocks held by American dealers. In such cases the films can be had direct by mail from the manufacturers. The cut films on the American market at present are Seed's celluloid films, grades No. 23, 26 x, 27 and Orthochromatic, and Carbutt's celluloid films, grades Eclipse and Orthochromatic. Other varieties can be had on special order.

In England cut films are manufactured by Austin Edwards, Fitch, B. J. Edwards & Co., Elliott & Sons Ltd, Ilford Ltd., Mawson & Swan, European Blair Camera Co. Ltd., R. W. Thomas & Co. and Sandell Films & Plates Ltd. This abundance of supply means a wide range in varieties, in which the British reader is more favored than his American co-worker. Austin Edwards makes a special film on setoloid, a cheaper basis than celluloid, with a matt surface on the uncoated side of the film. The Sandell film, consisting of two different emulsions without further support, is another special variety. All the others mentioned are celluloid films.

The makers of negative paper (paper films), which can be had in sheets and cut to any size desired are, in America "Rotograph;" in England the Rotary Photographic Co., and Wellington and Ward.



OLD BONN CHURCH, ISLE OF WIGHT
John Carbutt



BULL RING, BIRMINGHAM, ENGLAND
John Carbutt

Negative Making

Presuming, for the moment, that the reader already possesses a plate camera, with the usual equipment of plate-holders, the first step in photography with flat films is to secure a supply of film-carriers or sheaths. In this care should be exercised to see that the carriers lie flat and fit snugly into the holders. It is essential that the carrier bearing the film should not move loosely in the holder, and that the sensitive surface of the film registers exactly with the plane of the ground-glass focusing screen. Unless this has attention we may have faulty definition in our negatives.

In charging the film sheaths note that the sensitive side of a celluloid film is the dull side, the celluloid itself having a bright surface. This does not apply to setoloid films in which the emulsion side is rather more glossy than the matt surface of the setoloid.

When properly placed in their carriers or holders, the manipulation of cut films is practically identical with that given to plates. The sensitiveness of a brand of cut film is most easily determined by actual experiment. When a cut film bears the same emulsion as a well known brand of plates, as for instance Seed's 26x, the treatment should be identical in both cases. A generous exposure is always preferable to underexposure, however slight.

It is rarely necessary to back cut films, although in cases of severe contrast of light and shade the thin celluloid may give a trace of halation. Where this is indicated backing should be resorted to. The difficulty is one which will seldom, if ever, occur.

Developing Cut Films

Cut films are developed exactly like plates, except that plenty of developing solution should be provided so that, even though the edges of the film curl slightly, it will always be well covered. There are dishes with a groove at either end into which the film may be sprung, but these are not necessary. A very convenient plan is that suggested by Austin Edwards, of keeping a broad camel's hair brush wetted with the developer, and brushing over the films as they lie in the solution, thus keeping them moving and free from air bells.

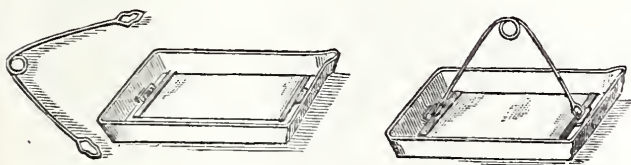
If the cut films adhere too firmly to the bottom of the developing tray, by suction, cement a piece of ebonite to the tray, which will prevent too intimate contact.

In consequence of the flexibility of the support, the sensitive film does not adhere as tenaciously to the celluloid support as it does to the glass plate. A little care in the choice of a developer will largely obviate any tendency toward frilling. The formula for the developer is not of great importance, so long as it does not contain ammonia or acetone or much free alkali. The first and last are apt to cause frilling if development is prolonged. The acetone will dissolve the celluloid base.

As with plates, so with films. The **A Formula** formula or developer advised by the maker of the films, will usually give the most satisfactory results. If practice does not agree with theory in this, the following much-praised pyrocatechin developer may be found useful. It is made up in concentrated solution and diluted for use as required. It gives a perfectly clear developer, keeps well, and is economical in use. Make up stock solutions as follows: No. 1. Sulphite of soda, $1\frac{1}{2}$ ounces; distilled water, 5 ounces; when dissolved add pyrocatechin, 150 grains. No. 2. Caustic soda, 110 grains; distilled water, 2 ounces; when thoroughly dissolved add No. 2 to No. 1, and the concentrated developer is ready. Store in a small, well-corked bottle without air space. For use with normal exposures, dilute the stock solution with 10 to 20 times its bulk of water, according to the character of negative desired. Note that cold water only should be used in making the stock solutions. Hot water will cause discoloration. Use care in handling caustic soda, as it affects the skin and fingers injuriously. A few drops of the usual 10-per cent solution of potassium bromide will act as a retarder in development.

Although most varieties of cut film become limp and lie flat in the developing solution, it may be well to know how to manage cut films with a tendency to curl. Sometimes the defect can be overcome by first wetting the film with water before applying the developer. A more

certain device is to attach a steel paper clip to each end of the film, and into each clip spring a wide handle which will keep the film stretched taut. Figs. 3 and 4



FIGS. 3 and 4.

give the idea, and the home-manufacture of the device does not present any difficulties.

Fixing and After Processes

A plain hypo bath is better for films than an acid bath, as the latter favors the separation of the gelatine film from its celluloid base. Several films can be fixed together at one time, but care must be taken to move them frequently, or white patches will be left in the parts where they lie on one another. This is a point where those long accustomed to plates often err. Unless the fixing bath has free access to the gelatine surface, the removal of the unaltered silver bromide from the film will not be completed. This precaution is equally necessary with rollable, and especially with paper, films in which the completion of the process of fixation cannot be seen. The rule should be to fix thoroughly in hypo 1 part, water 4 parts, for at least ten minutes after the white silver bromide seems to have disappeared. For many reasons the use of grooved fixing troughs or similar arrangements, where the films are completely held separate by their edges, is strongly advised for cut films. Such fixing troughs can now be had at slight cost, and are a big convenience in working.

The washing of films is best done in a zinc washing box with corrugated sides or grooves, similar to the fixing bath mentioned. When this is not available, secure pieces of wood slightly larger than the films to be washed, and pin each film to a piece of wood with film pins, such as may be had from the dealers. Float the

wood, bearing the film face down, in an ample-sized washing trough. An hour in running water will thoroughly wash the film. When running water cannot be had, eight changes of water of five or seven minutes each will be sufficient.

To insure films drying flat they are treated, after washing, to a few minutes' immersion in glycerine, 1 ounce; water, 20 ounces. In the directions accompanying certain makes of cut film, it is stated that this glycerine bath is not desirable.

The intensification and reduction of cut film negatives in no way differs from the manipulation of glass plates, except that ammonia should not be used. The use of any solution which clouds the celluloid support should be avoided when this is shown by experience.

As the reader will have gathered from what has already been written, rollable celluloid films are simply long strips of thin celluloid (bearing sensitive gelatine emulsion), wound onto a slender reel, or bobbin, called a spool. This strip is attached to a backing strip of black paper, which may or may not be considerably longer at each end than the band of film. In the former case the spool is termed a "daylight spool" or "cartridge film," since the extra folds of black paper protect the film from light, and permit the loading or changing of the camera to be done in daylight; in the latter case the charging of the roll-holder or camera must be done in a dark-room.

There is no need to describe here the various kinds of cameras and roll-holders in which rollable film of celluloid, paper, etc., can be used; nor is it necessary to set forth in detail how these pieces of apparatus are charged with film or unloaded. These details vary with the brand of camera or make of roll-holder and can best be learned from experience with an instrument in hand. The various instruction books issued by the manufacturers of roll film cameras are very explicit on all the points involved.

In the English market many varieties of roll film are obtainable. In America we have only the Eastman and Blair films. The different varieties differ little in



MICKLEGATE BAR, YORK, ENGLAND
John Carbott



OLD HOUSES AT CHESTER, ENGLAND
John Carbutt

rapidity and general quality, but more particularly in the method by which the various sections of the strip are numbered. The usual plan is to mark the black paper in white figures, denoting the first, second and other sections of the band—a plan possessing the disadvantage that when the film is rolled round the spool these figures are in contact with the sensitive surface. Unfortunately scarcely any substance is absolutely without action on a sensitive gelatino-bromide surface, so that it frequently happens that the figures on the black paper impress themselves upon the film and become visible on development. One method by which this defect is avoided consists in winding a strip of white paper behind the black paper, this white band having a series of minute perforations in it outlining the various figures. The numbers are therefore seen through the camera back in tiny black dots on a white ground and are easily distinguishable, and the result of this device, which is the patent of the Blair Company, is that only pure white paper comes in contact with the surface of the film.

Other makers use a highly enameled paper by which it is claimed that the film is more perfectly protected from atmospheric moisture and other influences and can therefore be used at a later date after manufacture.

Spools are sold containing 12, 6, 4 or 2 exposures, and unless other steps are taken any portion left unexposed must be wasted when the exposures are developed. But the

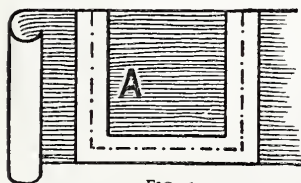


FIG. 5.

following simple device enables these odd pieces to be utilized: Take the whole of the black paper backing from a used spool and glue a number of L-shaped pieces to it, so as to leave a groove into which the cut film can be slipped. See Fig. 5.

Each spool will hold eight such pockets.

If, on the other hand, it is desired to take only one photograph on a spool of roll film, the following dodge

from *Photography* is worth bearing in mind: Put the spool in the camera and wind up till the last one is reached; then make the exposure and leave the film as it is. In the dark-room open the camera and cut off the film but leave the black paper intact. Next unwind the black paper and return it to its former position.

It is well to remove the film from the spool unless it is to be developed fairly soon. By doing so the annoyance of markings from the backing paper is avoided. A good plan is to cut the strip into lengths of two sections, and to place the pieces film to film in a light-tight, water-proof envelope.

The time during which a film will keep after exposure depends on the age of the film at the start and its protection from air and damp and heat. Some makers enclose a label in each spool, stating the latest date till which the film is guaranteed to keep properly. We will look into the "keeping quality" of films later.

The length of film or, say, half of it, can be developed in one piece or the film can be cut up into the separate exposures. The latter is the better method for the beginner, so I will describe it first. On unrolling the film from the spool, marks will be seen on the black paper indicating where the film is to be cut. Both film and paper are clipped off with a pair of scissors at this point and the pieces of film soaked film down in a dish of clean water until the films become limp and lie flat. They are then transferred one at a time to the developer in which three or four are kept at a time, still film down, and with continual transference of the bottom one to the top. Almost any film now on the market lies perfectly flat in the developer, and there is no need to bind down the films to glass plates with elastic bands or use a metal holder.

The second method is to handle a band of six or twelve exposures at once. This plan has several advantages: it is quicker and it avoids the danger of cutting the film at the wrong place. Further, if conducted as here directed, any exposures which have been over- and under-timed can be cut out and treated with

developers according to their separate needs. The only necessary addition to one's equipment is a large jug or jar filled with clean water. The band of film is unrolled, and if not more than 24 inches or so in length, preserved intact. If longer it is best to cut it through at the line dividing one half-dozen from the other. It is then lowered steadily into the jug of water until completely immersed, and moved up and down

a few times to get thoroughly wetted and softened. The film is now held festoon-fashion—gelatine side down—and the one end brought to touch the developer. This end is then gradually raised and the whole

film passed through the developer. See Fig. 6. This operation is repeated until the six or more images can be distinguished.

If all appear fairly

uniform it is best to proceed with the film in one piece, developing until sufficient density has been obtained. Then the band is rinsed in a basin of clean water, cut up into sections of, say, two pictures, and placed in the

fixing bath prepared beforehand.

If, however, the film shows very unequal exposures the band is removed from the developer to a jar or jug containing water in which a few crystals of citric acid have been dissolved. Development is thus arrested and the film can then be cut up and each portion developed separately as it requires. Developers for under- and overexposure are given in a following paragraph, but it may be said here that, according to Abney, rinsing the overexposed sections in 5 per cent hydrochloric acid and washing for a few moments before redeveloping is an excellent preventive of flat negatives.

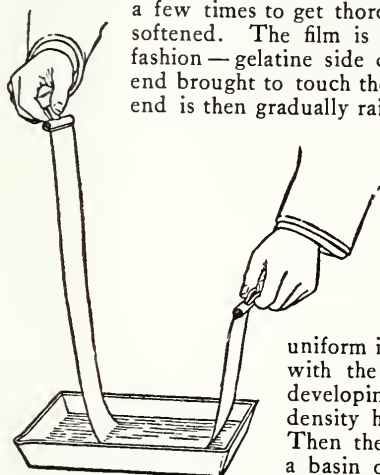


FIG. 6.

Aids to Development in Roll

England, is shown in Fig. 7. The film is fastened round the wheel and then passed through the developer contained in the trough. This latter is replaceable by others holding water or fixing bath.

A second fitment to serve the same purpose is also supplied by Messrs. Houghton. It consists of a cylinder of hard wood from which a wedge-shaped section has been cut (which section slides into the V-shaped slot left in the cylinder). A couple of India-rubber bands attach the cylinder to its vertical

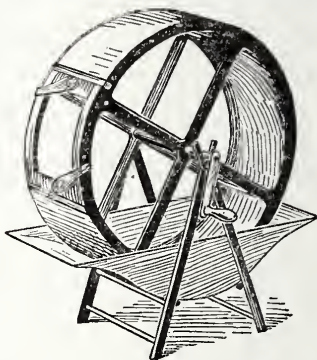


FIG. 7

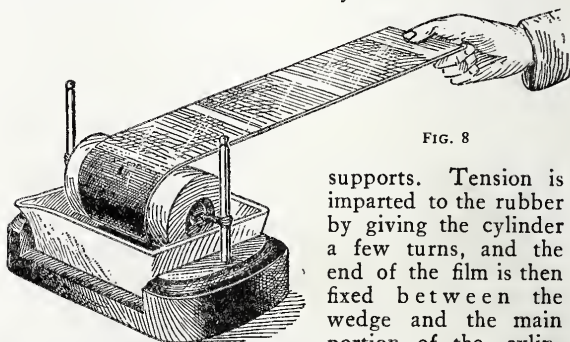


FIG. 8

supports. Tension is imparted to the rubber by giving the cylinder a few turns, and the end of the film is then fixed between the wedge and the main portion of the cylinder and allowed to coil round the latter. The film is unrolled by pulling its loose end, the tension of the rubber winding it round the cylinder again. It is

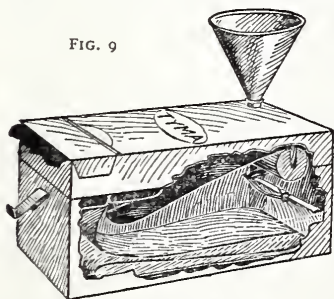
thus drawn to and fro in the developer and afterwards in water and the fixing bath. See Fig. 8.

A third and still more recent introduction by the same firm is the Tyma developing apparatus, designed to apply the daylight system even to the development and fixing of roll films. Used in conjunction with daylight-loading system, this handy piece of apparatus makes it possible to load a camera with roll film, expose, develop, fix and wash, in fact, to produce a number of negatives without recourse to ruby lamp or dark-room at any stage. In this apparatus the use of a time system of development is intended, particulars of which were given in *THE PHOTO-MINIATURE* No. 34.

The "Tyma" consists of a metal developing trough, in the lid of which is a spring holder, to hold the spool to be developed. The trough is filled with water to a certain mark, the black paper wrapper of the film drawn through a slot and the lid closed. The black paper is then pulled, thus unwinding the spool, which lowers the band of film into the water in three loose wave-like folds, the water, and subsequently the

solutions, thus having free access to the entire surface. This may be seen in the accompanying section, Fig. 9. After soaking for a little while the trough is tilted and the water syphons off, developer being now poured in through the funnel to take

FIG. 9



its place. Development is now timed, and the developer, in its turn, syphoned off and water poured in, and subsequently the fixing bath. Finally the trough may be placed, without opening, under the tap, and the long last washing completed without once disturbing or fingering the film, or, after fixing, it may be removed and washed in any convenient way.

The whole principle is ingenious; no complicated

mechanism is involved, so that there is little or no danger of anything going wrong inside the trough. The mere fact that the film during the entire procedure is untouched secures it against finger-marks, stains, and a hundred ills contingent upon want of dexterity, whilst the total exclusion of even red or yellow light protects the film from light fog. The one-solution developer, which is recommended on the printed instructions, is a well-restrained one, so that chemical fog is practically impossible.

For those who cannot avail themselves of these helps there are other expedients worth noting in the successful development of roll films. Some time ago Ottomar Jarecki described his method of development, with a home-made contrivance for keeping the film flat. I quote from his paper in the *Times*:

"It is too good a thing to hope for, that the average roll film you come across is going to lie flat and limp as per programme. Even if the old-time thin variety were restored to us—and why we have to do without it, who knows?—there is age and long confinement in close coils that give films a very kinky and contagious temper. The first attempt to remedy this defect as far as comfort in development was concerned, was to make use of the old-fashioned wooden spring clothes pins. These were clamped to the tray rim, having been provided with angle-shaped brass wires extending into the dish, under which the ends of the films were slipped. Incidentally, this tray was of tin, flowed over with melted paraffin and made to hold two strips of three exposures each, of the popular $3\frac{1}{2} \times 3\frac{1}{2}$ size. The pan measures $8\frac{1}{2} \times 12$ inside at the bottom, with flaring sides

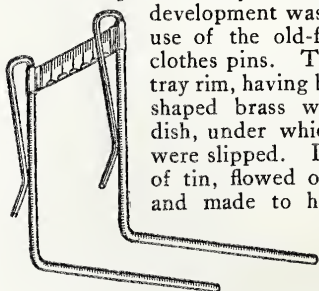


FIG. 10

and a rim $1\frac{3}{4}$ in. deep. Later, a wire clamp was devised independent of the clothes pins, and of this an illustration is given which will explain the idea fully. See Fig. 10. Size will suggest itself. Four sets of

clamps were attached to the dish, and the wires had thin rubber tubing slipped over them to prevent metal contamination. This small tubing is used for insulation purposes by electricians. This keeps the films perfectly flat, and to guard against another difficulty, that of the films sliding upon each other, a somewhat similar single clamp was set in the rim between the other two at each end of the dish. It will have occurred to the reader that this method does not encourage the wholesale development of numerous cut films, face down in one dish, as the inevitable damage to the surface is too aggravating to be tolerated by careful workers. On the other hand, not every one can rig up the Ferris-wheel style of developing a whole uncut roll in one strip.

"The fixing dish is similarly equipped, leaving off the dividing clamp, and it is just solid comfort to know that when a film is fixed, it is fixed all over and for good, without white patches showing at the final round-up.

"The soaking dish after fixing is arranged differently. Two stout brass wires are taken, bent somewhat in the shape of the cross-section of the dish, only skimmed half an inch or more in length and depth. This pair is laid across the dish lengthwise, and the films, two to the dish, are slipped under the suspended wires face down. The curl of the film keeps it off the bottom and thus in the best position to soak out the heavy hypo solution, and have it sink to the bottom of the dish. For fixing, a domestic granite-ware dish was cheaply procured, of dimensions 10 x 15 in., outside measure.

"A system of continuous working can be planned, so that while one pair is washing, another is fixing, and the third is being developed. When development is complete, each pair is advanced one stage, and the pair in soak is dropped into a pailful of water, there to remain until the final rinsing and glycerining."

Developers for Roll Film A good normal developer for strong, vigorous negatives is the kodak pyro formula: (1) Soda sulphite, 6 ounces; hot water, 32 ounces; when cold, add pyro, 1 ounce. (2) Soda carbonate, 3 ounces; potassium carbonate, 1 ounce; water, 32 ounces. Mix 1 part each of Nos. 1 and 2 with 2 parts of water.

In cases of underexposure dilute this developer with an equal volume of water. For overexposure add 10 to 20 drops of 10 per cent solution of potassium bromide to every ounce.

Pyro metol is a very rapid developer, suitable for snapshots, which usually have a minimum exposure. The formula is : (1) Pyro, 55 grains ; metol, 45 grains ; potass-metabisulphite, 120 grains ; potassium bromide, 20 grains ; water, 20 ounces. (2) Soda carbonate, cryst. (sal soda) 4 ounces ; water, 20 ounces. Mix 1 and 2 in equal parts. Both the above are apt to stain the fingers, wherefore I add here the formula of a very suitable developer for roll films which does not stain, referring the reader for further information on development to Nos. 11 and 34 of THE PHOTO-MINIATURE. The formula is as follows : (1) Ortol, 40 grains ; soda sulphite (cryst.), 160 grains ; water, 10 ounces. (2) Soda carbonate (cryst.), 20 grains ; soda sulphite (cryst.), 160 grains ; potassium bromide, 5 grains ; water, 10 ounces. Mix 1 and 2 in equal parts.

Several precautions must be taken when handling films, the need for which does not exist in the case of plates. The first is the constant movement of the films in the fixing bath, otherwise parts lying in contact with other films will not be protected from the action of the hypo and an unfixed patch will result.

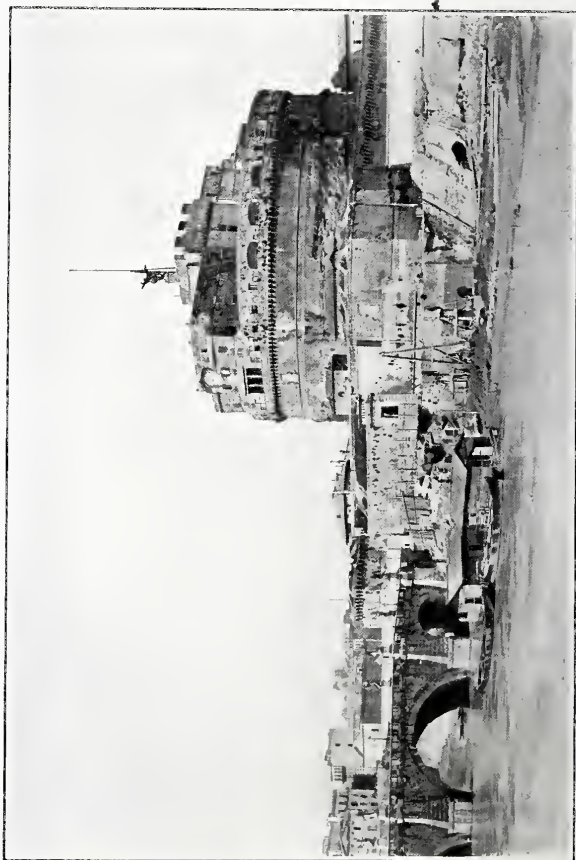
It is well, therefore, to bear in mind that fixing is not automatic as with plates, but that its completeness must be ascertained by holding up the film and making sure that no specks or patches of unaltered silver bromide remain in any part.

Another point of importance is the fact that the edges and corners of the film are sometimes sharp and may tear or injure the gelatine surface of other films in the same bath or tray.

Patches lighter or darker than they should be are due to the film not being covered by the developer. Left alone, part of the film rises out of the solution, with the result that the action of the developer on these parts soon stops. Two films remaining in contact in the developer



BRIDGE OVER THE RHONE AT GENEVA
John Carbutt



CASTLE OF ST. ANGELO, ROME
John Carbutt

causes the same defect. The preventive is to turn the lowest film on to the top, the next on top of that and so on at frequent intervals during development.

After fixing, the films are washed in running water for an hour, or with frequent changes of water as may be most convenient. If the film has been developed and fixed in the roll complete, by means of wheel or other apparatus, the washing can be best accomplished in the same manner. If the strip has been cut up into sections, the separate films can be thoroughly washed in the familiar syphon washers, or in a washing tank as used for negatives on glass plates. Another way is to pin a number of films to a board with push pins, and let this board rest at an incline under the tap in the dark-room.

After washing, we face the problem of drying our films without curling, so that they will lie flat for convenience of after-handling. To effect this it is usually advised to immerse the films in a glycerine bath. The effect of this is to make the films slightly damp—with a dampness or limpness which does not disappear, since glycerine volatilizes only at a very high temperature, and so preventing the gelatine from contracting and drawing the coated side of the film into concave form. The convenience offered by glycerine is undoubtedly great, but the method has its disadvantages. Films which have been glycerined seem to turn yellow with age, and are prone to stains and spots if the fixing and washing processes have not been perfectly carried out. Stains are also more liable to occur when glycerined films are printed from in albumen or other silver print-out papers. Nevertheless, the process is generally used.

The glycerine bath is made up of glycerine, $\frac{1}{2}$ oz.; water, 20 ozs. The films are immersed in it for five minutes, and are then removed, and wiped with a soft damp cloth. The solution can be used repeatedly.

Many efforts have been made to dry roll films flat (without curling) without the use of glycerine. Some workers claim that films show little tendency to curling if dried in contact with a sheet of glass. Lay

Drying Flat
Without
Glycerine

the wet film, celluloid side down, on a piece of clean glass and allow it to dry. Others lay their wet films on an inclined board and cover them with absorbent paper. Whether the wet gelatine films adhered to the absorbent paper is not stated. The best method yet suggested, which we have adopted with success, is that given by Dr. F. Raschig, in a German paper. It is to curl the roll of film in a spiral round a wooden cylinder, film side outward, the two ends being fastened with push-pins or thumb-tacks. In this way all the edges of the wet film are absolutely in touch with the drying roller. When the film is dry it should be permitted to remain fastened to the roller for a day or two, or placed near a stove where the temperature is 120° or 140° Fahr. for a few hours. This gives a flat film, easily and comfortably handled in after treatments, printing, etc.

To Prevent Films Curling Herr Lewinsohn, of Berlin, gives a method for the prevention of the curling of films during drying. He lays the films with the film side downward upon a table, and covers the upper side with a 1 per cent solution of caoutchouc in benzole, by means of an atomizer. After waiting a few minutes, during which time the benzole has mostly evaporated, two negatives are laid together, back to back, and they are thus united to one. No curling will now take place any more, even after the negatives are separated again.

Keeping Quality of Films There has been much discussion about the "keeping" quality of films of all kinds, from which a general fear has arisen that films are uncertain. There can be no doubt but that there is some uncertainty about celluloid, either cut sheets or rolls. It seems to be impossible to completely eliminate the acid used in their preparation, and the slight traces remaining in the celluloid even after long storage and drying or seasoning have, I believe, been chiefly responsible for such defective film as has appeared. Mr. John Carbutt, I understand, gives his celluloid stock treatment with an alkaline solution before coating with the emulsion. He sends a letter received from an African correspondent under date of November 14, 1901. This correspondent

had obtained successful results with Carbutt's Eclipse film three and a half years after its manufacture.

Mr. Percy Sheard, who has experimented with films for some years, writes :

During 1889 celluloid films came under my notice, and after several experiments of a varying but finally satisfactory nature, the new invention was adopted, and thus far no cause for regret has arisen.

Frequently one sees questions asked in magazines devoted to our dark art, relative to the keeping properties of films as compared with glass ; permit me, therefore, to record an experience which I believe to be unique. Though laying no claim to be a scientist, I am, as all photographers must be who claim to be successful even in a quiet way, a careful worker, and recognizing the importance of the lighter medium over glass, acted as follows :

Returning from a satisfactory holiday when only films were used, a purchase of several packets was at once made and carefully stored away. Each year succeeding 1889 a couple of these films were exposed on a simple subject, and the resultant negatives were in each instance found to be identical with those produced in 1889. In other words, no perceptible difference is remarkable between films manufactured eight years ago and used immediately, and the same batch exposed some few days ago specially before penning this article.

It was feared the vapor given off by celluloid would perhaps affect the chemistry of the emulsion, but in practice no such thing has taken place and in no way whatever does any deterioration seem to have occurred.

To increase the severity of the tests, an unopened packet of films has been subjected to continual extreme heat, being near the domestic hot-water supply. Again, some few went a long journey into Egypt and up the Nile, where on two occasions the shade temperature exceeded 102° F. Others have been kept in an out-building where frozen water pipes have performed their unwelcome vagaries. But on tests being made in the camera, no difference or falling off in quality could be discerned.

There remain still about eight of the original films,

but though they will be used as before, I consider my experience thus far sufficiently conclusive.

In claiming these performances to be unique, reference is intended not to the behavior of celluloid coated with a sensitive emulsion, but to what is probably a fact, that no amateur or professional is today in possession of continuous experiments made yearly up to 1897 with films manufactured nine years ago.

The makers of rollable films generally fix a somewhat short date beyond which no guarantee is implied should the goods not have been used. Having no intimate acquaintance with this material, I can offer no remarks upon their wisdom, because new factors may be, and probably are, introduced in the manufacture of this form of celluloid to render it more supple. My comments apply solely to cut films, of which I am able to speak so confidently and which in practice have been found so satisfactory.

Storing Celluloid Films A word about the storage of celluloid films should come here. They should be kept like plates in a dry place and away from gas fumes, but, above all, the films should not be subjected to too much pressure. On account of their being unbreakable, one is very apt in traveling to pile a great many things upon them, and this is often the cause of peculiar insensitive markings upon the negative. Captain Abney has pointed out that the effect of pressure upon a gelatino-bromide film is to destroy the sensitiveness of the parts pressed.

Films in the Tropics As a guide to those who have to use films in tropical countries I make space for some notes sent to me by a friend which explain themselves :

It has often been stated that celluloid films are unreliable in tropical countries. There is a measure of truth in this, but it is a wide general statement which is only true in special cases. Given as a reasonable condition, that necessary precautions are taken, the danger zone may be narrowed down to the sweltering low-lying *humid* parts of the tropics. Thousands of films, both roll and cut, have recently passed through our hands, the snap-shots of journalists and officers

engaged in the South African war, and in other African wars still nearer the equator. In some cases we have seen the entire results of some man's work, and in no case have we seen faults which could be charged to the climate, though there have been some which indicated inexperience on the part of the photographer.

Except that old bug-bear of the number printing on the film, the bulk of the troubles seem to occur when the film is in the camera, or otherwise exposed to the influences of atmosphere. The chief faults are a general fogging, the film sticking to the paper backing, and spots or fungoid growths on the film or support—more often on the support.

So far as possible a worker in the tropics should use films as fresh as possible, and preferably from some known home source rather than from an unknown dealer on the spot—this, of course refers to "out-of-the-way" places.

The films should be packed in hermetically sealed tins, either soldered down or the joint of the tin covered with a strip of rubber-cemented cloth, or of medical sticking plaster. The lid of the tin should fit tightly and there should be a generous shoulder, not less than three-quarters of an inch, for it to overlap. Films should be kept in the camera for as short a time as possible—this refers particularly to humid spots, where a fungoid growth has been known to occur over night—and returned to their tins and re-sealed as soon as possible. Films should be developed at home, as soon as possible after exposure. No one, unless experienced, should attempt to develop them en route. Any one who knows the whole gamut of "hot weather troubles" may attempt development at owner's risk.

Cristoid Films These films, manufactured by Sandell, are different from any of the other rollable or cut films, and may therefore be described in the words of their inventor. "The film is produced by coating a suitable surface either with a single coating of emulsion of a thickness sufficient to afford the necessary tensile strength, or with two, three, or more superposed coatings of graduated degrees of

sensitiveness, the coating (whether single or multiple) being afterwards stripped from the surface on which it is applied and used without any adventitious support. The surface upon which the coating (or coatings) of emulsion is (or are) thus applied is, preferably, that of a sheet or strip of glass perfectly flat and highly polished; and in order that the film may possess the hardness necessary to render it self-supporting, a hardening agent such as alum or formalin is incorporated in sufficient quantity with the emulsion. The proportion of the hardening agent will depend upon the initial state of hardness, varying within somewhat wide limits in the case of different parcels of gelatine as supplied by the manufacturers of that article. Generally speaking, however, about $1\frac{1}{2}$ per cent by weight of chrome alum relatively to the weight of gelatine used in the emulsion will suffice. The use of a hardening agent is of importance as tending to facilitate the manufacture of the film by accelerating the setting and drying of the emulsion, whether the films be formed of one or of several superposed coatings, it being, of course, necessary in the latter case to allow one coating to thoroughly dry before a further coating is applied.

The peculiar mode of preparation gives to the Sandell film a number of properties which set it in a place apart from other flexible sensitive materials. But the two chief of these properties are: (1) Its expansion in development. The area of the negative after development, fixing and washing is about 25 per cent larger than the finished film. This means that a 4 x 5-inch film becomes about $4\frac{1}{2}$ x $5\frac{1}{2}$ inches. (2) Its enormous latitude in exposure. Many readers of this monograph have possibly never used the Sandell plate or the similar multiple-coated plate made by Seed. But those who have will know that a double-coated or triple-coated plate possesses, when properly manipulated in development, an extraordinarily great latitude in exposure. Some 300 times the correct exposure can be given and without any alteration in the developer, but merely the use of a reducer after development and a properly graduated negative still obtained. I

convinced myself of the practical usefulness of this quality in the Sandell plate on its first introduction and precisely the same advantage attaches to the cristoid film.

Other minor points of difference between cristoid and celluloid or paper film are its inflammability and the absence of any supporting material. The latter especially is certainly an advantage, although in daylight cartridges and other arrangements of roll film, the unavoidable contact of the wrapping paper discounts the theoretical gain in the absence of a support.

The manipulation of cristoid film differs considerably from that of other films. The chief points of difference are emphasized below.

Cristoid film is supplied in cartridge spools or in cut sizes. The former call for no remark, but in putting the latter into the slides care should be taken not to handle them, especially with warm, moist hands. The moisture and heat cause them to crinkle, though they resume their flatness when laid down. Therefore they should be handled by the corners.

The method recommended by the **Development** makers is to adopt a time of development of six minutes, whatever the exposure of the film, and to afterwards reduce negatives of excessive density. Pyrocatechin is the developer preferred, made up from the following stock solution: Pyrocatechin, 1 ounce; potassium bromide, 30 grains; sulphite soda, 4 ounces; caustic soda, $\frac{1}{2}$ ounce; boiled or distilled water, 20 ounces. One part of this solution is mixed with 7 parts of water to make the developer.

The exposed films are first placed in a formalin bromide solution contained in a dish at least large enough to take the film after allowing for its enlargement. The solution contains: Formalin (40 per cent solution of formic aldehyde), 2 fluid ounces; potassium bromide, 60 grains; water, 20 ounces. The films are placed in this bath one by one, each being allowed to soften before the next is immersed. They lie perfectly flat. After the last one is in, the dish is rocked for three or four minutes, the bath poured back into its bottle for use another day and the developer poured on. Except

occasional turning over there is no need to attend to the films during the development, which lasts six minutes. The films are then rinsed in several changes of water and fixed. The fixing solution must be of extra strength, 8 ounces of hypo to 20 ounces of water. If weaker, or if allowed to become cold, the time of fixing the heavily coated film becomes tediously long, and one is tempted to remove the films before they are properly fixed. Washing is done just as for bromide prints.

Drying The films cannot be pinned down to
Cristoid Films dry like celluloid or paper negatives; they must be squeegeed to glass and ferrotype plates. These should be perfectly clean (by dusting with French chalk) and the film is squeegeed down and the plates put aside in a cool but dry place. When quite dry the negatives strip off without any trouble.

If the negative is required the original size of film five minutes in a bath of methylated alcohol (or Columbia spirit) after the last wash water will effect the desired amount of contraction.

Paper Film: As already mentioned, the use of paper as a support for the sensitive emulsion dates back to the beginning of photography, but at the present time sensitive paper for negative-making is prepared only by means of a gelatino-bromide emulsion. The advantages of the paper support are first lightness and, compared with celluloid, incombustibility. Then it can carry a more rapid emulsion than celluloid and is said to possess better keeping properties. Halation is rarely to be detected in negatives on paper, and lastly, the price of a non-stripping negative paper is much below that of plates or films. In opposition to these good qualities stand the greater or less grain of a negative on a paper support, the longer time in printing (unless the negative be "waxed") and the rather increased difficulty of deciding when development has reached its proper stage. One of these objections; viz., that of grain, cannot be allowed to stand in the way of paper specially supplied for negative-making such as the Rotograph negative paper, in which an almost grainless support is used.

Negative paper can be used in sheets in plate-holders or in bands upon the roll-holder spool. In the various operations which follow exposure it is appreciably easier to handle than celluloid films.

Bromide Paper

Ordinary gelatino-bromide paper, supplied by various makers for positive printing is capable of producing excellent negatives. There is more grain in the result, and as the film of emulsion is usually thin, exposure must be timed with considerable accuracy and a vigorous negative obtained by strong development. The more rapid brands of bromide paper are the most suitable.

Negative Paper

Morgan & Kidd, Richmond, England, were the first to make a negative paper, but at the present time (1902) the manufacture of negative paper is mainly in the hands of the Rotograph Company, New York, and the Rotary Photographic Company, London.

Exposure of Negative Paper

The handling of paper film in the roll-holder is exactly as described for celluloid film. In plate-holders also the negative paper is held like a cut film. Much larger sizes are, however, used more commonly than with cut films, for the two reasons that it is economical and that the slight grain of negative paper is not of the slightest importance in a large negative, but in these cases it is advisable to devote some care to securing the film in a perfectly flat state. The following method works well even with the largest sizes: Prepare some gummed strips of paper about one inch in width, and, having placed the piece of negative paper on its backing card lay on it a piece of clean glass, about one-quarter inch smaller all the way round, to hold it in position. Then damp the gummed paper and apply to the edges of the negative paper so that it becomes attached to the latter by a band one-quarter of an inch wide. Then turn over the card and paper, fix the gummed strip down to the back of the former.

Practically any developer can be used for negative paper, but as the paper support is much more liable to stain or discoloration the use of pyrogalllic acid is best avoided. A

Development

good developer is ortol, made up according to the following formula: (1) Ortol, 35 grains; potassium metabisulphite, 70 grains; water, 10 ounces. (2) Soda carbonate (crystal), 770 grains; soda sulphite (crystal), 550 grains; water, 10 ounces. Mix (1) 1 part; (2) 1 part; water, 10 parts.

In development the great thing to remember is that the completion of the process must be judged solely by the appearance of the paper when held up to the light, making allowance for the fact that the image looks much denser than it really is. The vigor of the print when viewing it in the dish is no guide whatever to the proper density of the negative for printing purposes.

Metol-hydroquinone offers a good developer for negative paper. Formula: (1) Metol, 40 grains; hydroquinone, 50 grains; soda sulphite, 120 grains; potassium bromide, 15 grains; water, 20 ounces. (2) Causitic potash, 180 grains; water, 20 ounces. For use mix equal parts of Nos. 1 and 2.

Fixing and Washing The avoidance of stain is an important point in negative-making on paper, therefore the paper negatives should be thoroughly rinsed in water for about five minutes between development and fixing. An acid fixing bath should be used, for which there is no better and simpler formula than: Hypo, 4 ounces; metabisulphite of potassium, 1 ounce; water, 20 ounces.

The negatives should be frequently turned over in the fixing bath, since it is not so easy to see whether they are completely fixed or not. Therefore, make sure by allowing a quarter of an hour in a clean bath made as above, constantly bringing the bottom print to the top and so on at short intervals.

An hour's washing in running water or many changes is then given. Though the former is less trouble, I am inclined to recommend the latter, because if a strong stream of water falls directly on to the gelatine film there is danger of it causing breaks or cracks and consequent blisters in those places.

The negatives are dried by hanging up or laying face up on blotters, or, better still, by squeegeeing them face down to clean ferrotype plates.

Printing from Paper Negatives The copies from paper negatives are best made on made printing paper such as bromide, platinum, carbon or matt gelatine or collodion, the grain of which masks any granularity in the negative.

The glossy gelatine or collodion papers are not suitable and will unpleasantly display the grain in the negative. If they are to be used the best plan is to interpose a sheet of thin celluloid or gelatine between negative and printing paper.

Printing takes considerably longer than if the negative image were on glass, but where a number of negatives are being printed at one time this is no serious drawback. However, if thought well, the rapidity of printing can be made practically equal to that of glass by oiling or waxing the negative. The grain in the paper is not diminished by this operation.

Waxing or Oiling The best, but most troublesome, method consists in ironing paraffin wax into the *paper*. I italicize paper because the gelatine film is impervious to the paraffin which must be applied to the back of the negative. The requisites for waxing are: A clean zinc dish a little larger than the negative, some paraffin wax, a clean jar and a saucepan. Paraffin wax can be bought at most drug stores. If not obtainable, the best "composition" candles with the wicks removed will do as well. Anyway, a pound or so of the wax is melted in a jar kept in boiling water. The zinc dish and the negative are thoroughly warmed before a clear fire and the liquified paraffin poured over the latter as it lies face down in the dish. Remove the print for a moment, and again immerse.

The wax penetrates the paper in a minute or so and the print is then lifted out and held near the fire to allow the fluid paraffin to drain off. It is then laid on one side to cool. If not uniformly waxed, it should again be warmed and drained and ironed with a hot iron while lying between two sheets of clear blotting paper.

Other methods of "translucing" the paper negative are: By using vaseline. Apply with a tuft of cotton

to the paper side of the negative, and then apply a hot flatiron, with a sheet of blotting paper interposed. Avoid getting vaseline on the face of the negative. If by accident it should occur, it may be removed by a tuft of cotton moistened with benzine.

Applying a solution of alcohol, 4 oz.; castor oil, 1 oz. Any oil on the face of the negative can best be removed by alcohol.

Stripping Films

The opacity of the paper support and the trouble involved in rendering it translucent have induced inventors to perfect a combination which could be separated at the end of the processes, leaving a thin transparent film. Reference has already been briefly made to one description of stripping films which at the time enjoyed a great vogue. At present, however, stripping film is represented by two commercial varieties: the "Wellington" film, made by Wellington & Ward, England, and the Cardinal film, manufactured by Albert Hofmann, of the Photo-chemisches Industrie, Germany. The Wellington film is retained on its paper support right through the various processes of development, fixing, and washing, and need not be stripped off until completely dry. The Cardinal film is transferred while wet to a sheet of glass, on which it is dried, being allowed to remain on the glass or stripped as preferred. The Wellington film can also be treated in this way, but as the makers point out, dry stripping gives absolutely no opportunity for the film to enlarge, contract, or become distorted. Both films are obtainable in England, not only in daylight and non-daylight cartridges, but in cut pieces which are used in plate-holders as already directed.

Wellington Film

This stripping film is handled in the plate-holder, or on daylight spools, exactly like celluloid film. Before development it is advisable—though not absolutely necessary—to soak them for a minute or two in clean cold water until limp. As regards developer formula, it is rather important to adhere to the formulæ recommended by the makers, as substances in the developer such as caustic alkalis, etc., make it difficult to strip off the film. The formulæ recommended are, for normal or time

exposures, pyro-ammonia: for rapid snapshot or similar work, pyro soda.

Pyro-ammonia: (1) Pyrogallic acid, Developers 1 ounce; soda sulphite, 2 ounces; citric acid, 40 grains; water, 10 ounces. (2) Ammonia (.880), 1 ounce; water, 10 ounces. (3) Potassium bromide, 1 ounce; water 10 ounces. Ten minims each of Nos. 1 and 2, and 5 minims of No. 3 are taken to each ounce of water.

Pyro-soda: (1) Pyrogallic acid, 1 ounce; soda sulphite, 2 ounces; citric acid, 40 grains; water, 10 ounces. (2) Soda carbonate (cryst.), 8 ounces; soda sulphite (cryst.), 8 ounces; water, 80 ounces. To make the developer, take 1 dram of 1, 1 ounce of 2, and 1 ounce of water.

The progress of development is watched by holding the negative up to the light. Though the appearance differs from that of a negative in similar condition, a little practice enables one to determine the point at which to stop development. Allowance should be made for the fact that the image appears considerably denser than when stripped. In cases of under-exposure the best plan is to dilute the pyro-soda developer given above with its own (or twice its own) volume of water. On no account should more of the No. 2 or soda solution be added, for excess of alkali is apt to soften the film and cause it to adhere to its support.

The Alum Bath This is not merely an item in the procedure to be used or omitted as with gelatine plates. It is absolutely necessary to the later processes of fixing and washing, for unless it is used, the film curls up and becomes unmanageable. Between development, and aluming, the films are rinsed for half a minute or so, and then placed film side up in alum 2 ounces; water, 40 ounces; in which they are kept on the move for ten minutes. They are then washed for 10 minutes and fixed for 10 or 15 minutes in hypo, 4 ounces to the pint of water. In this bath also the moving about of the films is of more importance than when celluloid films are being handled, for though it is difficult to explain it, it is nevertheless a fact that the film will not strip properly

unless moved about in these baths. From the hypo bath, the films pass to the washing tank where they are treated with running water or in frequent changes for an hour to ensure perfect freedom from hypo.

The Drying of the Films It is important that the films should be thoroughly and evenly dried. Squeegeed down to a piece of ferrotype plate and dried in a cool place, they will drop off when dry, or if it is not convenient to squeegee, they can be laid on blotting paper, but they curl up a good deal and have to be straightened out with a ruler. Squeegeeing to a ferrotype plate is greatly to be preferred. The negative at this stage consists of a film of gelatine on a paper support. It can be used in this form quite satisfactorily, although, of course, printing takes much longer. Therefore, the film itself is stripped off its paper support as follows.

Stripping Perfect dryness of the films is necessary for a clean strip. In damp weather they should be placed in a warm place for an hour or two. Then the film is laid on the table and a sharp knife passed across one extreme corner so as to cut through the gelatine but not through the paper. The point of the knife is then slipped between the gelatine and the paper, and the knife, blunt side foremost, run round the film to loosen the edges. On taking the gelatine film in one hand and the paper in the other, and gently pulling apart, the negative will leave the paper quite readily.

A good plan to dry a number of films for stripping is to mount them like print-out prints, on stiff card, set to dry and strip off as just described.

Expedients Some other points as to the handling of the Wellington film are here quoted from the makers' instructions: "The flatness of the finished film will be found to be very much improved by placing it, before stripping, under pressure for a few hours. If the films will not strip they are either not dry, have been *unduly* forced in development, or not kept in motion whilst in the alum and the hypo baths. If the films are apparently dry, they may be made to strip easier by placing them be-

tween two leaves of blotting paper, and passing a hot iron over them. The finished films, when stripped, should be kept between sheets of photo blotting paper and under slight pressure. They should not be kept between the leaves of an ordinary book, as the edges are liable to become puckered. A cockled film may easily be straightened by placing between two sheets of *slightly* damped photo blotting paper and placed under pressure. (A slight steaming of one of the blotting sheets is sufficient.)"

**Cardinal
Films**

According to Hofmann these are made as follows: Smooth paper is coated with substances soluble in alcohol, ether or benzene, such as resin alone or softened by admixture with fatty oils or turpentine. Shellac, gum sandarac, or mastic, with castor oil, turpentine or pine-tree resin are suitable materials. A coating of hardened gelatine covers this resinous layer and insulates the sensitive emulsion from the organic bodies mentioned above. After development the film is separated from its paper support by an alcohol bath in which the resin dissolves.

The development of the films calls for no special remark after what has been said. After development they are placed in 1 per cent acetic acid solution for a minute or two and then fixed in a bath of sulphite and thiosulphate. After the hypo has been washed out they are placed for five minutes in: Methylated alcohol, or Columbia spirit, 10 ounces; water, 10 ounces; glycerine, $4\frac{1}{2}$ drams; formalin (40 per cent solution of formic aldehyde), 4 drams. Here the resinous layer is dissolved but still retains sufficient adhesiveness to hold gelatine and paper together. The film is then squeegeed, gelatine side down, on to cleaned and talced glass or ferrotype plate, the paper backing removed and the gelatine film allowed to dry. It then strips off from the glass with the greatest readiness.

**Intensification
and Reduction** Celluloid films are treated exactly like negatives on glass (see THE PHOTO-MINIATURE NO. 15). I need only remind the reader of the extra care which should be given to the perfect fixation and washing of the film.

If stripping films, such as the Wellington film, have to be treated in this way, it is best to intensify or reduce before stripping; but if the defect in density one way or the other is not discovered until the paper support has been removed the film should be soaked for a quarter of an hour in a saturated solution of alum, and then well washed. This toughens it sufficiently to permit of its subsequent handling. In the after operation it expands some 20 per cent, and, if the enlargement is not undesirable, it has only to be squeegeed to a glass plate and stripped off when dry. If, however, it is required in its original dimensions, it is placed in a bath of glycerine, 1 ounce fluid in Columbia spirit 40 ounces, for 15 minutes before squeegeeing and stripping.

Hand-work
with Pencil
or Brush

The matt surface of some films, e.g., the Austin Edwards Setoloid films, or the Wellington film, after stripping, renders spotting and retouching easy work and, guided by the instructions in THE PHOTO-MINIATURE NO. 12 and with the following hints, the reader should have no difficulty in carrying out any after treatment as easily as on glass. The first thing is some means of holding the film in place. A piece of card with an aperture slightly smaller than the film is hinged to a piece of glass, and the film slipped between. This simple device permits of it being placed in the retouching desk in the ordinary way, but care should be taken not to cockle a gelatine film by laying the warm, moist hand upon it; a piece of card should intervene.

It is quite safe to spot or dot a gelatine film, but to apply patches of water-color to such a film is certain to cockle it. Brush work of this kind must be done before stripping.

For hand treatment on celluloid films the front may be utilized, but it is best to leave the image side intact, I think, as work of this kind has so often to be removed and done again. The celluloid side of the roller film does not take kindly to water-color, and the best way to provide a surface for it is to bind up the negative with a bit of matt celluloid—matt side out—using ordi-

nary lantern-slide adhesive strips for the purpose and working them on the matt surface with color or stump.

Paper films allow plenty of retouching with a pencil on the film side and with crayon or color on the paper side. Then they can be oiled locally by applying the mixture of Canada balsam and turpentine already given, or with castor oil, 4 parts and ether, 1 part, or with vaseline as already mentioned.

Ordinary varnish cannot be used for

Varnishing either celluloid or gelatine films since it is not possible to heat the surface of the negative. Nor must celluloid films be varnished with a medium containing alcohol (except with the qualification below mentioned) since the spirit acts upon the gelatine and cockles up the film. For celluloid films the borax-shellac varnish is best. It is made thus: Borax, 1 ounce; shellac, 5 ounces; water, 20 ounces. The borax is dissolved in the boiling water, the shellac added in small pieces and the whole kept hot until a clear solution results. It is then put on one side to cool and any precipitate allowed to settle. For a few days it remains cloudy but eventually becomes quite bright. The films are immersed in this either wet as they come from the washing tank or after drying. The latter is best as the varnish is then taken up directly by the gelatine film. Otherwise it has to diffuse in. The difference is exactly that between developing a plate with or without previous soaking in water. After 5 minutes immersion the films are removed, drained, and hung up to dry. Another formula for the water varnish is: Shellac, 1 ounce; soda carbonate, cryst (sal soda), saturated solution, 8 ounces. The two are allowed to stand together in the cold for 24 hours, the liquid is then poured off and replaced by an equal quantity of water. Water and shellac are now boiled until the latter dissolves when, after filtering, the varnish is ready for use.

Another suitable varnish is made by diluting ordinary white hard varnish with half its volume of water and then adding just enough ammonia to clear it.

Gelatine films (dry) are best varnished with a celluloid preparation which will also serve for celluloid films *if dry*. I give two formulæ: (1) Celluloid, $7\frac{1}{2}$ to

10 parts in 500 parts amyl acetate. (2) Camphor, 150 grains; papyroxiline or celloidine, 300 grains; methylated alcohol (Columbia spirit), 20 ounces. Dissolve the camphor in the spirit, add the papyroxiline. Shake at intervals until thoroughly dissolved, then filter and allow to stand till quite clear.

Cristoid films are varnished by coating a clean glass plate with celluloid varnish; letting this dry and squeegeeing the film down on it instead of to plain glass and allowing to dry. Before stripping, the film of varnish outside the edges of the negative is cut through. If before doing this a coat of varnish be applied with a brush, a perfectly waterproof negative is produced.

Stripping Film It is often convenient to transfer the negative taken on flexible film to a rigid glass support. In the case of stripping films like the Wellington or Cardinal films this can be done simply by squeegeeing down to a glass plate coated with gelatine. A spoiled plate, fixed and washed, answers this purpose, or instead the plates are coated with a gelatine solution made as follows and used warm: One ounce of Nelson's No. 2 gelatine is allowed to swell in 12 ounces of cold water for half an hour, and then dissolved by standing the vessel containing the mixture in boiling water. When quite fluid, 5 ounces of methylated alcohol, or Columbia spirit, are added with constant stirring, and 15 grains of carbolic acid added. These proportions are those given by Wellington & Ward; the mixture being also a first rate mountant. This preparation is applied warm to the glass plate and the coating allowed to set. The film having been squeegeed down, one corner of the paper is raised and the film pressed down with the blade of a knife. The paper backing can then be removed. If any difficulty occurs in the film coming away, it may be placed in the alcohol-glycerine-formalin mixture given on another page for Cardinal films.

Transferring Celluloid Films To transfer films from a celluloid support to glass, the best method is that of Lainer. The following solution is made: Caustic soda, 10 grains; formalin, 10 minims; water, 1 ounce. The celluloid negative is

placed in this for a short time until the film commences to separate from the support. Test this by rolling back the film from one end in a cylinder across its width, and then transfer to a bath of: Glycerine, 25-35 minims; hydrochloric acid, 25 minims; water, 1 ounce. In this solution it can be entirely detached and transferred to a gelatine-coated glass plate prepared as above described. It enlarges one-thirtieth of its length in the transfer.

Any gelatine film expands when placed in plain water so that a convenient means of very appreciable enlargement is thus provided. The method is applicable to both stripping and celluloid films, though slightly different in each case. I take stripping films first and cannot do better than quote the directions given for the Wellington film: "Negatives made with the intention of enlarging them in this way should be considerably over-developed so as to allow for the reduction in density which takes place when the film expands. One of the corners should be gently rubbed between the finger and thumb and then, having thus started a separation, the two are readily pulled apart. The stripped film is washed to remove the hypo and is then placed in a dish of water containing a few drops of ammonia to the ounce. The larger the proportion of water the more will the film expand. It will be found possible to enlarge a film one-fourth or even one-third of its length. If the negative is allowed to become dry just before stripping, the expansion will not be so great. As this enlargement makes the film thinner it must be transferred to a piece of glass to act as its final support. To do this a piece of glass is taken and thoroughly cleaned with whiting and ammonia. It should then be soaked with the gelatine solution already described and reared up to dry. It is placed in the dish of water under the film which is adjusted with the fingers into position. Then the glass being gently lifted out with the film upon it is allowed to drain for a minute or two and stood up in a rack to dry. A slight washing after the ammonia bath is all that is necessary, as a small trace of ammonia left in the film will soon disappear in the drying.

For celluloid films, the Lainer method already described is followed by the ammonia bath just given.

Cementing to Glass It is less trouble and often just as convenient to cement the roller film to glass for printing, enlarging, and so forth. The most suitable cement for this purpose is Canada balsam, thinned down if necessary with benzol. The thinnest possible film of the cement is applied to the glass plate and to the celluloid side of the film, the two surfaces being then closely pressed into contact and kept under pressure for some time.

Printing from Rollable Film The film negative, whether on rollable celluloid, gelatine, or paper film, is printed in an ordinary printing frame, a piece of plain glass being inserted in front of the film. Those of an economical turn of mind can make very neat little printing frames for any of the many small sizes of film cameras according to the following from *The Amateur Photographer*: "Cut two strips of glass to make the hinged back of the camera, joining them with stamp paper or court plaster [or better, a strip of leather from an old glove affixed with fish glue or Prout's Elastic glue. Ed.]. Next get two $\frac{3}{4}$ -inch rubber bands with which to bind the hinged back with an uncut piece of glass of the same size. See that the bands do not cover the front of the film which is placed on the uncut slip; lay the sensitive paper on it, then some backing and lastly the hinged back."

Printing from Wet Films When a print is wanted in a hurry, the negative film, whether celluloid, paper or stripping film, can be printed from wet. The plan has the advantage also in the case of paper films that the grain of the paper is much diminished. The following are working details as given by Wellington & Ward for their paper stripping film:

"A piece of bromide paper is soaked in water until quite limp, and is then laid face upwards on a clean plate. The film negative, having first been washed to remove the hypo as thoroughly as time would permit, is placed downwards on the paper, and the two are squeezed into contact.

The other side of the glass is backed up with a piece

of millboard or other opaque substance, to prevent light getting at the bromide paper from behind and fogging it, and the whole is held up with the back of the wet film 12 inches from a gas or similar flame for twenty seconds, more or less, according, of course, to the density of the negative. The two are then separated, the bromide print developed, and the film may be squeegeed to ferrotype and completed in the usual way as already described."

**Enlarging
from Films**

To support the film in the enlarging lantern there is nothing better than a couple of pieces of thin glass, hinged with a strip of stout paper or leather and bound tightly together with India rubber bands. The film is sandwiched between the two and thus placed in the carrier (kit) of the enlarging lantern. The glasses should be patent plate free from scratches and bubbles, and should be slightly larger than the film.

**Printing
Methods with
Films**

The details of printing from film negatives in the various processes are no different from the same operation when glass negatives are used and are described in earlier numbers of *THE PHOTO-MINIATURE* (viz., Platinotype No. 7, Blue-printing No. 10, Carbon No. 17, Albumen and Plain Paper No. 21, Gum-bichromate No. 22). One or two wrinkles, however, in connection with films may be mentioned. A very tasteful way of finishing off a print, viz., with a black band all round, is easily done in the case of films simply by trimming down the film squarely to the exact size of picture and printing on a somewhat larger size of paper. The same method is especially pleasing when making lantern slides by contact, the margin having a deep black but transparent tone, which usually gives a more pleasing effect on the screen than the absolute dead black of an opaque mask.

The film can be printed from either side with practically no difference in the results except that the image is reversed as regards right and left when the celluloid or paper side is placed next the printing paper.

By interposing one or more pieces of clear celluloid (old films with the gelatine cleaned off) between the

negative and the paper, an often advantageous softening of outline is produced. The reader who feels that his pictures will benefit by diffusion of the definition should try the experiment of printing with celluloid in between paper and film.

Keep your films neatly packed one
Storing Films or two in an envelope between a couple of pieces of card. This is as simple and as efficient a way as any, though others may prefer the albums or holders specially supplied for the convenient storage of flexible negatives.

This is a defect which I have come
The Crinkling of Celluloid Films across to a small extent in the negatives of others. After the lapse of some few years—ten or twelve—the films have crinkled up so as to be perfectly unprintable. The defect made its appearance in the case both of glycerined and non-glycerined films. I cannot prescribe a remedy or preventive of what—in the rare cases when it does occur—is an extremely annoying phenomenon. It has been recommended to immerse such films in a glycerine bath, or to leave them in a damp place where they may absorb moisture. The defect has further been ascribed to contraction of the celluloid, in which case there is nothing to be done but strip off the films and mount them on a glass or thicker celluloid support.

Our review of film photography,
Acknowledgment despite its obvious shortcomings and omissions, has already extended to greater length than was intended. We have covered the principal points concerning the manipulation of films, and have made plain their advantages and disadvantages. Other details must be left for a second excursion into the subject. With the exception of a few pages this monograph was prepared by Mr. George E. Brown, joint editor of *The Photogram*, of whose patient help my cordial appreciation is here recorded.

BOOKS.

Traité de Photographie par les Procédés Pelliculaires.
 G. Balagny. 1890. Paris, Gauthier-Villars et cie.

Les Phototypes sur Papier au Gélatinobromure par F. Quénisset. 1901. Paris: Gauthier-Villars et cie.

Les Negatives sur Papier. Chapters by various writers. 1901. Paris. Ch. Mendel.

Das Arbeiten mit Films. M. Kiesling. 1901. Berlin: Gustav Schmidt.

In English the various booklets published (gratis) by makers of the different kinds of negative films may be read with profit. W. Jerome Harrison's "History of Photography" (1888) gives valuable historical notes on the subject, as does Marion's work on "Paper Photography" published in London in 1862.

NOTES

The May number of THE PHOTO-MINIATURE, now in press, will include a monograph of unusual interest, dealing with "Color Photography." A plain account of light and color from the photographic point of view occupies the first part of the monograph, leading up to a practical method of producing photographs in colors on glass by superimposed stained films. In order to practically test the method, apart from the author's claims, the manuscript was given to an amateur who, by simply following its instruction, produced completely successful results. The monograph is the work of Mr. R. James Wallace, of Chicago, whose papers on "Isochromatic Photography" now appearing in the "Photo-Beacon" prove his right to speak with authority on color photography and kindred subjects.



All the illustrations in this number of THE PHOTO-MINIATURE, with the exception of Mr. George E. Tingley's "Light Beyond," will interest the reader as reproductions from photographs made by Mr. John Carbutt on his well-known celluloid cut films. It seemed peculiarly desirable that the first treatise on film photography in English should include examples of work done on films made by the pioneer manufacturer of cut films, and we are glad to present Mr. Carbutt's work.



While writing of Mr. Carbutt we may mention that he has recently transformed his business into a corporation, admitting his two sons, Mr. John E. Carbutt and Mr. Robert F. Carbutt, to an interest in the concern.

The title of the new corporation is the Carbutt Dry Plate and Film Company of Philadelphia, the capital

stock being \$150,000 fully paid and non-assessable. The company will continue at Wayne Junction, Philadelphia, the business of manufacturing dry plates, films and other photographic specialties established by Mr. John Carbutt in 1878. The new firm on an old foundation has our best wishes for its continued prosperity and success.



A booklet full of lens information, entitled "The Collinear Lens," has just been issued for free distribution, by the Voigtlaender & Son Optical Company, 133 West 23d street, New York. The text is cleverly put together and presents some vital lens facts in a new way, with illustrations. A copy can be obtained by sending a postal card to the address here given and mentioning this magazine.



Camera Notes, Vol. VI, No. 1, which reached us a few days ago, possesses a special interest as the last number published under the editorial direction of Mr. Alfred Stieglitz and his associates, to whom the publication of the magazine was committed about five years ago. The number is almost an inch thick and contains a remarkable profusion of interesting articles and illustrations. A special feature is the publication of the catalogue of the library of the Camera Club, a clever bit of work well carried through, for which the librarian of the club, Mr. Juan C. Abel, deserves the highest praise. The Canfield collection of photographic books and magazines, presented to the Camera Club by Mr. John Aspinwall, are here for the first time catalogued and made accessible for ready reference.

It is quite impossible to detail here the many attractions of this issue of *Camera Notes*, but a copy can be obtained by sending one dollar to *Camera Notes*, 3 West 29th street, New York. It is certainly worthy of preservation by all who take any interest in photography in America.

As the subjoined letter indicates, Mr. Stieglitz and his associates, Joseph T. Keiley, Dallett Fuguet and

John Francis Strauss, have severed their connection with the magazine, which will hereafter be edited and conducted by Mr. Juan C. Abel. According to information received, *Camera Notes*, under the new management will fully sustain the high reputation it has at present.

THE CAMERA CLUB, N. Y., May 26, 1902.

EDITOR: THE PHOTO-MINIATURE

Dear Sir:—In accordance with the statement made in the pages of *Camera Notes*, Vol. VI, No. 1, a copy of which is mailed under separate cover, we have to inform you that with this number our connection with that magazine ceases. Henceforth we shall be neither directly nor indirectly connected with any branch of this publication, our severance being absolute and complete.

Hoping that you will be able to give this space in your valuable publication, we remain

Yours truly,

ALFRED STIEGLITZ,
JOSEPH T. KEILEY,
DALLETT FUGUET,
JOHN FRANCIS STRAUSS.

The Camerists' Guide is an attractive and useful booklet for amateurs, just published by Edward W. Newcomb, 888 Bible House, New York. Those desiring a copy can obtain it for the asking by mentioning this magazine.

A sensitized collodion emulsion for the three-color process and general halftone and reproduction work, has been placed on the market by G. Gennert, 24 East 13th street, N. Y. This emulsion is six times as fast as ordinary wet collodion and is orthochromatic. There has long been a demand for this convenience, and we are confident that it will meet with wide appreciation at the hands of process workers.

Martin G. Good, 86 State street, Chicago, sends us a copy of his new 150-page pocket catalogue, listing the

various specialties and staples obtainable at his store. The list is carefully prepared and includes all standard apparatus and materials, without waste of words or windy explanation. A brief list of helpful books is given at the end for the convenience of the reader. We can commend Mr. Good's services and catalogue as alike designed to satisfy and please the practical worker in photography.

C. P. Goerz, 52 Union Square, N. Y., sends a booklet describing a most ingenious combination of opera glass, field glass and photographic camera for single or stereoscopic pictures in one instrument called the Goerz Photo-Stereo Binocular. It would be folly to attempt to describe the combination here, but a copy of the booklet (illustrated) can be had by writing to the manufacturer and mentioning this magazine.

The Forty-seventh Annual Exhibition of the Royal Photographic Society of Great Britain is announced to be held at the New Gallery, London, from September 29 to November 4. Entry forms and circular of particulars can be had from the Secretary, R. P. S. G. B., 66 Russell Square, London, W. C. and foreign exhibitors should apply for these without delay.

A practical convenience for developing and handling plates and films is the S. & F. Plate (or Film) Handle, manufactured by the S. & F. Manufacturing Company, Reading, Pa. These useful helps are inexpensive and deserve to be more widely known and used. We advise our readers to send to the manufacturers for the illustrated circular describing their advantages.

At the last meeting of the Royal Photographic Society (London), Mr. Thomas R. Dallmeyer, F.R.A.S., read a short paper on his new Adon lens system for attaining magnification of image without loss of rapidity.

It was hardly necessary, he observed, to point out that the chief objection to the present telephotographic systems was the rapid diminution of the intensity of the system for increasing magnification. The initial intensity of the positive element was reduced in direct proportion to the linear magnification. The problem of obviating this defect within practical limits led to the construction of the "Adon" system. To maintain the initial intensity of the photographic lens for any degree of magnification at its focal plane, the parallel emergent pencil from the magnifying system (Adon) must be at least as large as the effective aperture of the ordinary lens system to which it is applied, and the effective aperture of the positive element of the enlarging system must be as many times greater in diameter than the emergent pencil as the degree of lineal magnification desired. To take a concrete example: Assuming that we have a lens of $5\frac{1}{2}$ inches focal length, working at $f/8$, its effective aperture being 7-10 in., in order that its intensity may be maintained at the focal plane the parallel emergent pencil from the "Adon" must be 7-10 in. in diameter, and this determines the minimum diameter of negative element of the system. For a linear magnification equal to 2, the positive element of the system must be at least $\frac{1}{4}$ in. in diameter, and twice the focal length of the negative element. The author of the paper discusses the theoretical requirements of the "Adon" system, the optical construction of which is such as not to interfere with either the spherical or chromatic corrections of the lens to which it is applied. The "Adon" system may also be used by itself as a telephoto lens.



We are asked to announce that *Anthony's Photographic Bulletin* and *The Photographic Times* will hereafter be combined in one journal, to be published monthly as *The Photographic Times-Bulletin*, under the editorship of Mr. Walter E. Woodbury. The combination should make a strong magazine, and Mr. Woodbury has our best wishes for the success of the arduous labors which await him.

Tennant and Ward's List OF NEW BOOKS AND PUBLICATIONS

THE LADY POVERTY. A XIIIth Century Allegory, telling how St. Francis of Assisi wooed and won that most difficult of all brides, my Lady Poverty. A delightful volume for all interested in Franciscan and mediæval literature. Written A.D. 1227, now rendered into English for the first time. Translated and edited by MONTGOMERY CARMICHAEL. 209 pp. Cloth. *Net*, \$1.75.

AMERICAN PICTORIAL PHOTOGRAPHY. Representative examples of the work of the American School of Pictorial Photography. Selected by and reproduced in photogravure under the personal supervision of ALFRED STIEGLITZ, and formerly published by "Camera Notes." Series I, *net*, \$10. Series II, *net*, \$6. The edition was limited to 150 copies of each series, and only a few sets are obtainable. Descriptive circular on request.

THE "CAMERA NOTES" IMPROVED GLYCERINE PROCESS for the development of platinum prints, including the experiments of ALFRED STIEGLITZ and JOSEPH T. KEILEY. Illustrated with facsimile reproductions in color, by the experimenters. Reprinted from "Camera Notes." Only a few copies obtainable. Paper covers, *net*, \$1.

AN INDEX OF STANDARD PHOTOGRAMS. Being a guide for Authors, Editors and Publishers of Illustrated Books and Periodicals, Collectors of Pictures, etc., listing photographs available for publication purposes. Sold by subscription only. Particulars on request.

PHOTOGRAPHY FOR NATURALISTS. By DOUGLAS ENGLISH. A book for those interested in photographing animals, etc. 132 pp., fully illustrated. \$2.50.

PRACTICAL NOTES ON TELEPHOTOGRAPHY. By BECK LTD. A pocket-book of practical information. Cloth, 25 cents.

[READY IN JULY.]

THE A B C OF PHOTO-MICROGRAPHY. A practical handbook for beginners, by W. H. WALMSLEY. With plain instructions and many engravings. About 130 pp. Cloth, *net*, \$1.25.

PHOTOGRAPHIC APPARATUS, its making and repairing, by various English writers. Cloth, *net*, \$1.

FINISHING THE NEGATIVE. An encyclopedic treatise on all the processes between development and printing. Edited by GEORGE E. BROWN. 160 pp. Cloth, *net*, \$1.25.

THE LENS. A practical guide to the choice, use and testing of photographic objectives. By GEORGE E. BROWN and THOMAS BOLAS. Profusely illustrated. 130 pp. Cloth, *net*, \$1.25.

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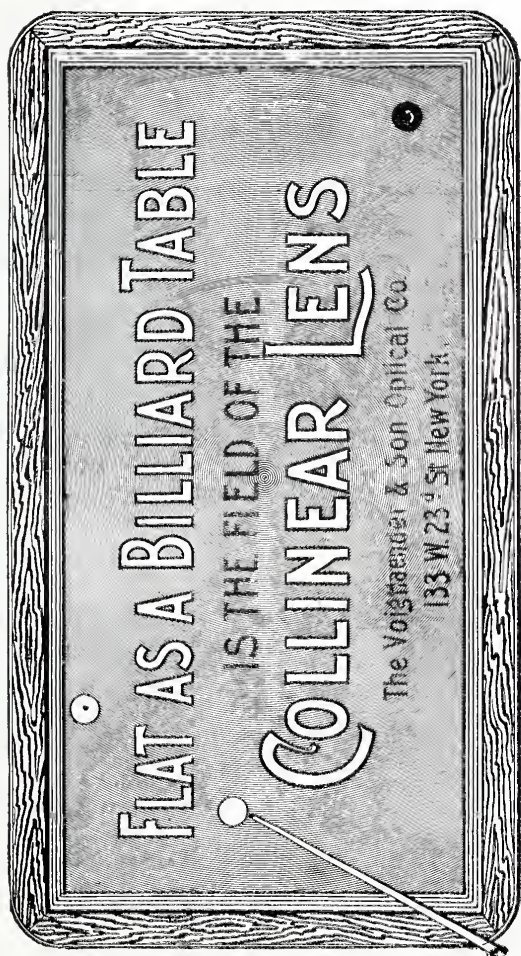
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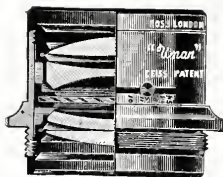
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Baraka, Libreville, Gaboon, West Africa, Nov. 14, 1901.

MR. JOHN CARBUTT,
Keystone Dry Plate Works,
Wayne Junction, Philadelphia.

Dear Sir:—I enclosed to you last month a negative of two bouquets of flowers. Neither the bouquets nor the negatives are specially remarkable, except that the latter is made on an "Eclipse" Film which I brought to Africa with me in 1897 (the date stamped on the package was August 28, 1897), and which was not exposed until May of this year. They had been kept in a sealed tin, which I opened in May, and made a number of exposures, which developed such clear negatives that I thought you might be interested in seeing how well the films work after three and one-half years.

Yours truly,

E. A. F.

Price of Films

Size	Per doz.
3 1/2 x 3 1/2	\$0 50
3 3/4 x 4 1/4	55
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12 6 1/2 x 8 1/2	" " " "	24 ozs.	12 6 1/2 x 8 1/2	" " " "	62 1/2 ozs.
12 8 x 10	" " " "	32 ozs.	12 8 x 10	" " " "	106 ozs.

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Pocket photography was only made possible by the Kodak film cartridge. Not only does the Kodak go inside the pocket, but inside the Kodak goes the film—all becomes one compact, self-contained mechanism. The "pocket" plate-camera may, on the other hand, be ever so small, ever so ingenious, but that doesn't mean pocket photography, because some method must be provided for carrying the heavy, fragile plates and the bulky, cumbersome plate-holders.

A Kodak Film Cartridge for 12 exposures, $3\frac{1}{4} \times 4\frac{1}{4}$, weighs 2 ounces; one dozen $3\frac{1}{4} \times 4\frac{1}{4}$ glass plates and six double plate-holders weigh 1 pound and 12 ounces, or just fourteen times as much.

A No. 3 Folding Pocket Kodak, *including its load of twelve exposures*, weighs less than an equivalent in glass plates and their holders, *to say nothing of the weight of the "pocket" plate-camera.*

A No. 3 Folding Pocket Kodak, including its load of twelve $3\frac{1}{4} \times 4\frac{1}{4}$ films, contains 20 per cent less cubic inches than six double plate-holders, *to say nothing of the cubic space taken up by the "pocket plate-camera" itself.*

The Folding Pocket Kodak loads in daylight; with the plate-holder-camera a dark-room is a necessary evil.

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Wherever the photographic art is practiced—and that today is wherever on this earth the sun's rays shine—there is the ubiquitous Kodak. Not only in this country but the world over it has won the tourist heart. Everywhere Kodak film is taking the place of the fragile glass plate and the cumbersome plate-holder.

Dr. Leonard Pearson, of the Pennsylvania Live Stock Sanitary Board, recounts an interesting experience in his travels which adds another testimonial to the world-wide triumph of Kodakery:

HARRISBURG, PA., Jan. 26, 1902.

EASTMAN KODAK CO., ROCHESTER, N. Y.

Gentlemen:—Last summer I went one night, in a sleeping car, from Dresden to Vienna. In my compartment were four other men. One was an Englishman connected with the British Consular Service, one was a German commercial traveler, one was a young Russian who was making "the grand tour" of Europe, and the fourth was myself—an American bound for Budapest. There is nothing noteworthy in this, excepting one fact that interested us as travelers thrown together by chance, and it may interest you. Each of us carried a photographic camera and each camera was an Eastman Kodak. Yours truly,

LEONARD PEARSON.

"WE GIVE YOU JUST WHAT YOU ASK FOR"

*A Short Sermon on the Practice of "Substitution"
by Storekeepers*

Outside a drug store on North State street you may read the announcement, "We give you just what you ask for."

We are glad to seize upon this occasion to pay a tribute to this motto, and incidentally to point out a dishonest and very common practice among merchants—that of substituting one article for another.

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Eastman Kodak Company

ROCHESTER, N. Y.

One business man devotes all his energy, his money and his time to building up the reputation of a certain article. He enables the retailer to make a large profit, and he spends his money that customers may be plentiful.

When a customer asks for the article in question it is dishonest to say to him as many do:

"Don't buy that. We have something else just as good and much cheaper."

If the merchant has something good and cheap of his own, let him sell it to his customers by all means. But let him not steal the trade of a man whose energy helps to build up his business. Let him not divert to his own pocket all of the profit which he ought to, in honesty, share with another.

There are wares that are made enormously profitable to the retailer simply because men push their business with intelligence and perseverance. It is ungrateful as well as dishonest, for the sake of a little extra profit, to cut into the legitimate business of the advertising manufacturer.

Incidentally the public, as well as the storekeeper and the manufacturer, is interested in this question of substituting one article for another.

That which is represented as "just as good" is usually *not* just as good, but very far from it.

If a man has spent a million dollars building up the reputation of a certain article it is to his advantage to keep up the quality of the material which enters into the manufacture of that article. His profit is large if he is honestly treated, and it would be suicide for him to use inferior material for the sake of a little extra money.

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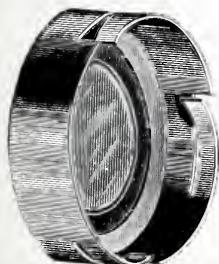
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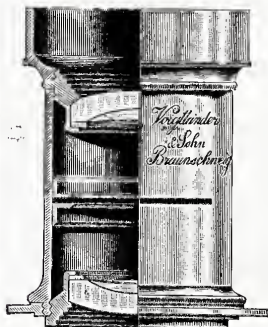
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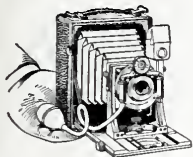
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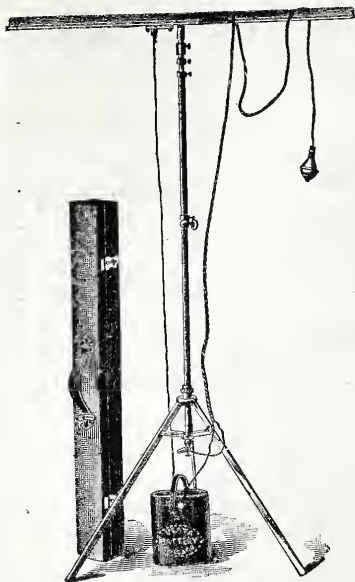
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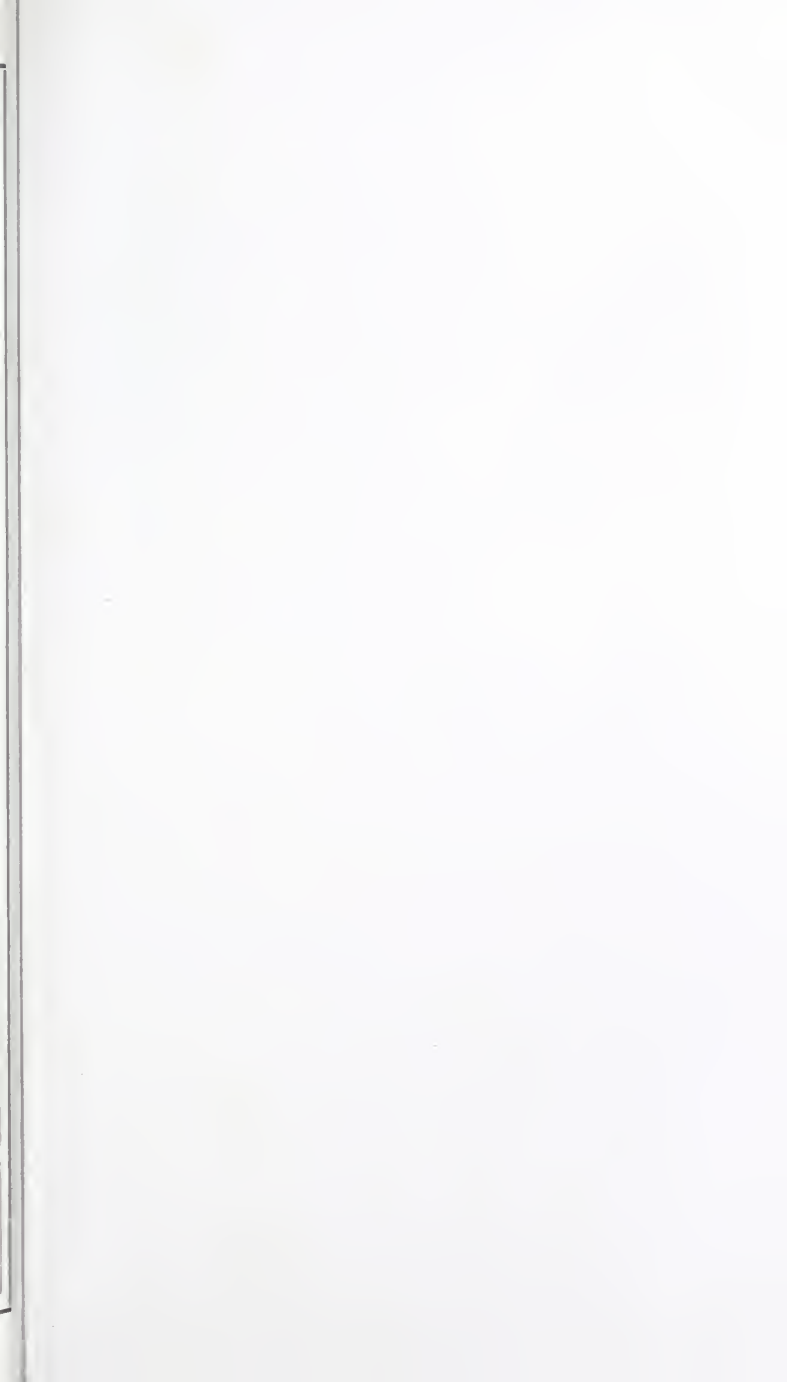
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Number 38

COLOR PHOTOGRAPHY

Because men seek most earnestly that which they cannot possess, so, since the beginning of photography, its followers have sought nothing so persistently or with such intense longing as a method for producing photographs in colors. No sooner was THE PHOTO-MINIATURE well begun than there came request upon request for a little book about color photography, a little book giving the most practical of the many methods published here and there. Until within the last few months, however, all the methods have been interesting as experiments rather than as practical processes capable of yielding results with ordinary care. Latterly the method of superimposing stained films seems to have achieved a certain amount of popularity. It has undoubtedly given wonderful results. This is the method described in these pages by one who is well acquainted with the advantages and disadvantages of all the principal processes. It has been tested in a very practical way since it was written for publication, and has proved itself fully equal to all reasonable requirements. The monograph is published without addition, revision or correction, just as it came from its author, Mr. R. James Wallace. EDITOR.

“To most people a photograph in natural colors means a photograph which, when looked at as a painting is looked at, shall, like a painting, appear with the various objects sending to the eye colored rays of the same tint as they had in reality.”*

* “Photography in Colors.” R. Child Bayley.

To obtain such a photograph by the ordinary method of making a negative, and from that a print on paper, we require a sensitive substance capable of absorbing and reproducing the various tints as they may fall upon it. It is hardly necessary to say that we do not possess such a substance, nor is there any immediate probability of our being able to obtain it. When photography was first discovered and introduced to public notice, there seemed to be such a little step from the representation of objects in monochrome to their reproduction in natural colors that the earliest works published on photography abound with the records of enthusiastic experimenters seeking to solve the problems of color reproduction. Among those early enthusiasts there are a few names that stand out as milestones along the way, pointing even at that early date to the methods which we now term "modern."

The general practice of photography is sufficiently well understood by the reader of these pages to render unnecessary any résumé of its evolution; but with regard to the reproduction of color by photography the layman is not so well informed.

In beginning this talk upon color photography it is not my intention to go more deeply into the subject of light and color than is absolutely necessary to a clear understanding of the matter, that the reader may trust not alone to the formulæ which follow, but may also understand why such and such formulæ or methods are advanced. Necessarily many points must be handled with extreme brevity. In treating of light, for instance, no mention will be made of the proofs which go to confirm the theory of ether waves or ether disturbances as the true physical cause of that which we know as light. Sufficient for our present purpose that we recognize light as light, in the same manner that we recognize a certain geometrical form to represent the letter A, or another to represent the letter B.

Nearly every one is acquainted with the fact that if a beam of white light is passed through a glass prism there is formed a colored image which is known as a spectrum, meaning "image" or "appearance," and as in this

Light and
Color

case the image has been produced by the aid of a prism it is known as the "prismatic spectrum."

The Spectrum It was Newton who first discovered that light, which had hitherto been considered as a simple thing, was a mixture—a compound, and that the prism added nothing to the beam but simply split it up or separated its several constituents. This may be easily proven, for if we pass a beam of light through a prism to obtain the spectrum which falls upon a screen suitably placed, it ought to be an easy thing to reproduce white light by simply combining those colors of the spectrum. And so it is; for, if in place of the screen, the spectrum falls upon a lens, it is again combined and forms a spot of white light at the focus.

Returning now to the property of the prism to analyze white light by spreading out the constituent colors as a spectrum, we find these to be six in number, and always in the following order, viz., red, orange, yellow, green, blue and violet, each color of which is pure and incapable of further division, as may readily be proven by repeating another of Newton's experiments. He took a piece of cardboard in which he cut a narrow slit and placed it in the path of the spectrum rays so that all the colors were blocked out save the one which passed on through the slit to the screen—say blue. Then he interposed another prism, through which he passed the ray, to see if it could be split up still further. But it remained a blue, and even when passed on by a lens the resulting spot was blue, showing conclusively that further analysis was impossible.

The same holds true with every other hue in the spectrum: they are pure in themselves and incapable of further division. "White light, therefore, is composed of a great number of differently colored rays distinguishable from one another by the rapidity of their vibrations, or, in other words, by the length of their waves." (Paterson.)

The Color of Objects We are now in a position to understand that color is inherent in light, and it may further be taken as understood that the colors seen in the spectrum really succeed each

other in the order of their wave-length, the red rays having the greatest wave-length and the violet rays the least. We are taught that what we call color is merely a sensation and has no actual existence, being produced in a variety of ways, but preëminently by the action of light on the retina of the eye. We see an object either because it is self-luminous, or because it *reflects* light from its surface, and recognize what we term its color, by either the absorption, diffraction or dispersion of that light — as any text-book will explain.

The instrument used for the study of the spectrum is the spectroscope, various forms of which are now in use, but all depending upon the passage of a beam of light through a glass prism.

In the year 1802, Wollaston first descried the presence of a number of dark lines or bands in the spectrum, dividing the otherwise continuous image by small gaps of darkness. In 1814 Fraunhofer, a German optician, counted and mapped a number of them, giving to the principal lines the first eight capital letters of the alphabet, to which he later added two more, viz., small a and b.

These lines are fixed and immovable, never varying in their positions, and are, therefore, of the greatest



FIG. 1. Showing the position of the principal lines in the solar spectrum.

possible assistance to the student when describing or referring to pure colors with scientific accuracy. In Fig. 1 may be seen a diagram showing the position of these principal lines, although it must not be understood that these ten constitute the entire number. Fraunhofer counted over six hundred lines, and with the improved instruments of the present day, recent workers have with the aid of photography mapped thousands.

It is unnecessary to explain here the significance of the lines of the spectrum; sufficient that they are understood as immovable in the spectrum of sunlight.

There are three "constants," as they are termed, which accompany every color, named hue, purity and luminosity.

The first of these is what we usually term the color; that is, we say a color is red, or blue, or yellow, as the case may be. The second, purity, refers to its admixture with white light (therefore other hues); while the third, luminosity, refers to the brightness of the hue in question. Thus a certain red may be taken, for example magenta, and defined scientifically. We would say: hue, red; purity, low (because it contains an admixture of violet); and luminosity, high, presuming of course that the color sensation or visual effect was bright.

Although there are six colors in the spectrum of white light, yet it has now been demonstrated that the optic nerve is so constructed as to be capable of distinguishing but three elementary color sensations, which produce, by their various degrees of admixture, all the combinations of shade and hue found in nature. These three colors are red, green and blue-violet—and are known as the true primaries.

This theory was first communicated in modern times by Young in 1802, and later developed by Helmholtz and Clerk Maxwell in 1852 and 1860* respectively. It should not be overlooked, however, that centuries before the same fact was apparently grasped by Aristotle, who wrote: "The colors of the rainbow are those which, almost alone, painters cannot make. For they compound some colors; but *scarlet, green and violet are not produced by mixture*, and these are the colors of the rainbow."†

The usually accepted theory of the primary colors is that they comprise red, yellow and blue. So long as we are dealing with pigmentary colors this is true. The scientist, however, does not deal with pigments,

*"James Clerk Maxwell and Modern Physics:" Glazerbrook.

†"Principles of the Science of Color:" W. Benson.

which are impure, and simply owe their hue to the partial absorption and reflection of the incident light, but with light itself, and experiment proves the former idea to be correct, for if we take three lanterns each projecting a disc of light onto a white screen, first causing each beam to pass through a colored solution, selected so as to transmit only the red, green and blue-

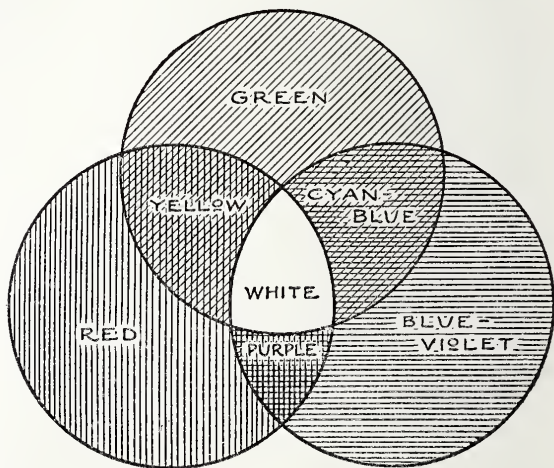


FIG. 2.

violet respectively, and the edges of these colored discs be caused to overlap, then the result as shown in Fig. 2 will be seen.

Where red and green mix we get *yellow*; green and blue-violet give us a peacock-blue; where blue-violet and red overlap we obtain a purple, and in the center where all three overlap they give us white. In other words, were the screen illuminated by the three colored discs, all covering the same spot, it would appear to the eye as a circle of light, which would be indistinguishable from ordinary white light until analyzed by the spectroscope.

**A Historical
Note**

In consideration of the various methods which have been advanced or adopted for the production of photographs in natural colors, it is not my intention to deal exhaustively with the subject, but to skim rapidly over it, touching only lightly upon the different processes and finally coming to rest upon that one, which by ease of operation and quality of results has obtained a well-merited popularity. With regard to this process all necessary details will be fully explained, and in such a simple manner that, "he who runs may read."

In the year 1801, Herr Ritter, of Jena, first called attention to the fact that the various colored rays of the spectrum differed greatly in their action upon a silver compound. In 1810 Seebeck, also of Jena, carried on these observations until he succeeded in reproducing the spectrum with a rather crude approach to natural color.

At about the same time, Wollaston, in England, succeeded in obtaining a slight measure of success in the same direction, and a little later, Niepce (1829) in certain of his early photographic experiments, noticed that if the plate were held at a certain angle more or less color was apparent to the eye. This, incidentally, was due to the same cause which makes possible the "modern" color process of Lippman, viz: interference.

Then followed in rapid order Sir John Herschel (1839), Hunt (1844), Becquerel (1849) and Beauregard (1856), each as an independent investigator, but all endeavoring to obtain the colored image upon a chloride of silver base with one print. In 1859-62 Louis Ducos du Hauron in France and James Clerk Maxwell in England both enunciated the theory of modern photography in color, by proposing the making through color-filters of three photographs to represent the three primary color sensations, and superposing the three images by means of three optical lanterns.

These latter ideas were enriched by suggestions from Collen (1866), Charles Cros (1867), Vogel (1885), and the present-day workers of note as Von Hubl, Ives, Lippmann, Joly, McDonough, Wood, Lumière, Selle, Abney, and others.

It is unnecessary to repeat these experiments in detail here. To those readers who may be interested the bibliography at the end of this monograph will point the way for deeper studies; but it is proper that we enter a little more deeply in explaining briefly the different processes which have been perfected sufficiently to be exploited with more or less commercial success.

McDonough-Joly Method The McDonough-Joly process, which with intelligent handling, is capable of very perfect results is as follows: A

sheet of glass is ruled with parallel alternate lines or bands of transparent red, green and blue-violet, at a gauge of about three hundred lines to the inch. The colors are selected to closely approximate the three primary color sensations. This ruled screen is placed in the camera, immediately in front of and in contact with the surface of the sensitive plate, which has been dyed so that it is sensitive to all colors of the spectrum. Now when we photograph, say, a green leaf (which for the purpose of explanation we will assume as reflecting green light only), the color has to pass through the green ruled lines of the screen before it can reach the sensitive surface of the plate, the blue-violet lines stop all color from passing through them except blue light, and as our object is only reflecting green light, no light therefore reaches the plate immediately behind and in contact with the blue-violet lines in the screen. The red lines in the same way stop all light but red, and as we have in the present instance only green light, therefore no light reaches the plate in those portions which are immediately behind the red lines. Thus we have a full action through one set of lines, the green, and no action at all through the remaining two sets, the blue and red.

When such a plate is developed we find that the only effect we can obtain is that of deposit (density) in the places which were covered by the green lines, with transparency or entire absence of deposit in the spaces covered by the blue and red lines.

Taking now this negative and making therefrom a positive, by contact, we will obtain a plate exactly the reverse of the negative and in which the blue and red

spaces will be opaque with deposit, while the green will be represented by clear glass. All that now remains to be done is to place the transparency in contact with the ruled color screen in order to obtain the correct representation of the object photographed, for, as we have the blue and red lines opaque on the positive, these colors are covered over, or blotted out, and only the green remains to be carried through the transparent portions of the positive.

**The Ives
Method**

The Ives process, like the method of McDonough, depends for its results upon the admixture of colored lights.

Three separate negatives are made by the action of the three primary colors through colored light-filters. From these negatives are made three positives, which are backed by colored glass of a somewhat different tint from that used in making the negatives. The red positive is backed with red glass, the blue with blue, and the green with green, in a special instrument named the Kromskop, and by an arrangement of transparent mirrors the three colored images are caused to superpose and combine, the one upon the other, so that viewed through an observing lens they present to the eye an image in natural colors. The Kromskop is made either monocular or binocular, and in the latter case the object not only presents itself in color, but also with that relief which is so charming in stereoscopic vision. There is also due to the untiring energy of Mr. Ives the advantage of being able to take the three primary negatives in one operation, by the aid of a special camera, which splits up the light into three colors of measured luminosity, thus greatly simplifying the operation.

The results are very beautiful, especially when in place of the Kromskop use is made of three lanterns, and the object or view is projected upon a screen. Here there is no "lining" to mar the view, and the three colored lights mix in perfect homogeneity.

[NOTE: The Sanger-Shepherd and Lumière methods, both yielding practical and admirable results, are now commercially available. The information afforded by the manufacturers to those purchasing the necessary supplies for the methods is so complete and satisfactory as to make it unnecessary to give space to their manipulation in these pages. EDITOR.]

The diffraction process of Prof. Wood and the interference method of Lippmann may be regarded at present as but little more than beautiful laboratory experiments, and need hardly be considered in a work of this class as the many technical difficulties yet to be overcome do not warrant our taking them up in detail.

Having thus mentioned the various processes available for the reproduction of color, we will now enter upon that one which offers the most practical results, and at the same time is the simplest in execution,—that of the superposition of stained films. There is nothing in the process which cannot be carried out by the intelligent worker, and the materials are ready to hand or can be obtained in any town of size. Briefly described the process is as follows: First, the making of the three selective color negatives through the screens or color-filters, and their development. Next the sensitizing of three films and printing of the negatives upon them by contact, followed by the development of the printed films by the aid of hot water. After the development, the films are fixed out, cleared, and finally stained with solutions of aniline dyes. They are then dried, superposed the one upon the other, and bound in the same manner as a lantern-slide (or with the addition of a piece of ground glass if wanted as a transparency). These operations may seem lengthy and complex, but in reality they are not so extended as they seem in the telling, and the various methods become mechanical.

I purpose now to take up in detail the several steps or stages of the process, giving directions in the simplest and most practical manner, which experience has shown to be allowable.

A great deal has been written about spectroscopic work and its necessity in color photography. As I have occupied no inconsiderable portion of the past ten years in practical work of this sort, I am in a position to give simply the principal results obtained, and thus eliminate for the student not only the lengthy experimental operations, but also the necessarily expensive apparatus required, and place in his hands that knowledge which could not be obtained otherwise.

It may be as well to state in the beginning that success is not possible unless the instructions be carefully and conscientiously followed. There is nothing which can be slurred or lightly passed over without the certainty of its showing as an imperfection later on, when it is too late to remedy it. Make it a rule to follow instructions closely, and with the utmost care. Don't let "good enough" go may be taken as a maxim which cannot be impressed too strongly.

**Secret
Formulæ**

Sir W. de W. Abney, in a paper recently read before the Camera Club of London, says: "Whether any one who is engaged in three-color work has any secret method for obtaining his screens I am not aware; if founded on scientific experiments they must be open secrets." As it is impossible to make up these filters without, of necessity, encroaching upon the laws of science, then the so-called and much-vaunted secret resolves itself simply into two points: First, the knowledge of what we wish to obtain or, in other words, what we desire the filters to do; and second, the use of such physical and chemical knowledge as we may possess in order to so construct the filters that they will fill the necessary requirements.

Being deeply interested in all matters pertaining to trichromatic photography, besides being actively engaged in the commercial success of the same, it is natural that the writer has had ample opportunity to observe the jealous care with which these so-called "secrets" are guarded by the numerous more or less successful operators at present engaged in that business.

It is the fate of all processes which are "new" to become surrounded by a net-work of mystery, the workers therein building up about themselves and their efforts a wall of secret methods which precludes the spread of their knowledge to others. They reason that if they were to make their methods public they would have to divide their trade, forgetting that as the process becomes more publicly understood, the increasing demand would certainly justify the increased supply.

It is unnecessary to enter into any analysis of human nature to show why this conservative reserve should be

so prevalent—sufficient that it certainly exists, and it is here my purpose to show how fallacious is that idea.

That the experimentalist in this line of work should possess a fairly good knowledge of the science of light and color is a *sine qua non*, and if he does not already possess it, his first aim should be to get a clear grasp of the subject in his mind and have a thoroughly comprehensive knowledge of it, for it is only by this familiarity that he can hope to have a measure of intelligent success. This advice may seem unreasonable, but so does the practice of scales to the uneducated, would-be musician. First then, let it be understood that a knowledge of light and color is essential to success.

Of course it is not possible that the student of color will long be without the aid of the spectroscope, and when its use is learned there will open to his mental view such a marvelously new and beautiful world, teeming with such glorious surprises, that the subject will grow and expand with the power of a new awakening. I have divided the work into two points as stated above and will now take them up in their order. First, what do want our light-filters to do? or rather what do we want to do at all? This leads me right into the subject.

To make a set of three negatives, as records of the three primary colors we must first of all select plates suitable for the work. The only way to do this intelligently is by spectroscopic tests—not visually, but photographically. From an experience covering, I believe, every plate upon either the European or American market, I append, in Fig. 3, a few of the most characteristic results. No attempt has been made in delicate focusing of the Fraunhofer lines; sufficient that the principal groups show as “position finders.”

It will be seen that there are wide differences between the various plates, and an intelligent appreciation of these differences is half of the work.

Taking first the yellow printing-plate (the basis of which is a negative made by the action of blue and blue-violet light), it can plainly be seen that in a number of cases

a color light-filter is absolutely unnecessary, for some of the plates show action only in the blue and violet, together with a slight action in the invisible ultra-violet. This latter is difficult to show on the print by any of the ordinary methods of reproduction, owing to the slightness of deposit. In other words, such a plate as A in Fig. 3, for example, needs no color-screen.

The primary object of any light-filter is to cut out or absorb from the spectrum (or the white light) those colors which are not required to act upon the plate, roughly speaking the red, yellow and green in this case. But if the plate used is itself utterly insensitive to these colors, what is the use of filtering them out?

There is another point to be considered in the construction of suitable filters, and that is their absorption of the colors they allow to pass. If a beam of homogeneous colored light has, for example, a luminosity of 50, the dye selected for use as a filter must allow that color to which it is transparent to pass through without suffering any material degradation. In other words it must as closely as possible approximate that luminosity when passed onto the plate. Should the filter (or screen) absorb, by reason of lack of transparency, say 50 per cent of the luminosity of the blue and violet which it allows to pass, it will still be suitable for use, but the time of exposure would be lengthened because the filter has introduced black or absence of light. Experiment, however, has conclusively proven that the use of a violet filter is in many cases an unnecessary complication, provided a plate is chosen which is sensitive with normal exposure to only the blue and violet rays. I say with normal exposure because with many plates, for example Seed's 26X, a lengthened or abnormal exposure to the spectrum will result in action throughout the remaining rays, even into the red, but, of course, at the expense of the blue and violet, which are enormously overexposed. Such a plate will develop with full printing density by the action of the blue and violet rays alone, and cannot, unscreened, be exposed for any other, without resulting in an excess of "fog" and "density," which would render it entirely useless for our purpose.

The "Red"
Negative So much for the blue negative, now we come to the *red* negative—the basis of the print in blue. In this case, as before, our first duty is to examine the unscreened action of the various spectrum negatives, and as a plate is wanted which is sensitive to the red, then we find that in B C D E and F of Fig. 3 there is a decided action, although compared to the blue it is very slight. Here the action of the screen is of much value.

Inasmuch as the plate in B, Fig. 3, shows an inferior degree of sensitiveness to the red with a maximum of sensitiveness in the blue, it must be screened with a filter which will allow red light to pass freely, but which will stop utterly the green, blue, violet and ultra-violet rays. In this event they will be represented by blackness, and of course they cannot impress themselves upon the plate. Upon giving a somewhat lengthened exposure, to allow of the slower action of the red rays giving a deeper and stronger deposit, development will give us a negative which will record the action of only the red rays of the spectrum (or white light).

With reference to the dyes used in the red light-filter, I would say that there are many such, for example dyes from the eosin group are all good, the principal point to look for being the certainty of the cutting off of the ultra-violet or violet light, which is assured by the introduction into the red of a modicum of yellow. The result, when sufficient exposure is given, as before stated, is shown in Bz, Fig. 3, where by the use of a double slit on the spectroscope I show not only the solar spectrum unscreened but also the results due to the introduction of the red screen and with a somewhat extended exposure.

The "Green"
Negative Taking up now the negative made by the green light, the basis of the print in red, a plate is selected as formerly, but taking care that it shows a distinct action throughout the green. This is by far the most difficult, but yet presents no insurmountable impediment if approached with active intelligence. No matter how good an action we may obtain upon an unscreened plate, the

blue or yellow would still be far in excess, and it is because of this (as in the case of the red) that we require to cut off or screen the undesirable rays, this time the red, blue, violet and ultra-violet. Now in the case of such a plate as that represented in H, Fig. 3, the strongest action is shown to be in the region of the yellow and the blue, with a decided drop in the sensitiveness to the green, just where it is most required.

The work to be done is first to cut down the blue and violet light at the one end, and to reduce the extreme sensitiveness to the yellow at the other. Almost any yellow dye of sufficient purity will fulfil the first requirement, while almost any blue or violet dye will perform the latter, so that by combining a yellow and a blue, or violet, and using the combination as a light-filter, the band of sensitiveness may be shifted to just that portion of the spectrum in which it was deficient as in H₂, Fig. 3.

I am aware that this bold method of treatment may meet with adverse criticism, but these statements have been carefully considered, and strengthened by years of constant experiment covering, to the best of my knowledge, a fairly complete list, to date, of the organic dye-stuffs, with (in the majority of cases) their photographic record.

**Color-Filter
Formulæ**

There is probably no portion of the subject of color reproduction which has had so much written upon it, or had such a number of formulæ given as this. Much has been written that is good, but it is generally so hedged about with technical terms that it remains practically a sealed book except to the scientist.

For the three filters the first consideration is the glass, which must be selected of a size sufficient to cover the lens

The Glass used, either circular or square. The thickness is of no moment provided that when finished all three filters be of exactly the same measurement, for in the case of one filter being somewhat less in thickness than the remaining two, one may be certain that the resulting three images will be of different sizes, or to speak technically, will "lack registration," a fault which no

after-manipulation will modify or overcome. We must be sure, therefore, that the glass selected be of equal thickness in the three filters.

The Use of Lantern Plates There are two methods available in making the filters:—first, to select the glass and coat it with plain gelatine, which is afterward stained by bathing; or to select from a box of lantern-slide plates three pieces which, when tested for thickness by a micrometer, register approximately equal—at least within $\frac{4}{1000}$ of an inch—and to fix out, clear in ferrocyanide and hypo, then stain. In the hands of the writer this last method has given excellent results, the plates used being Carbutt's lantern-slide plates.

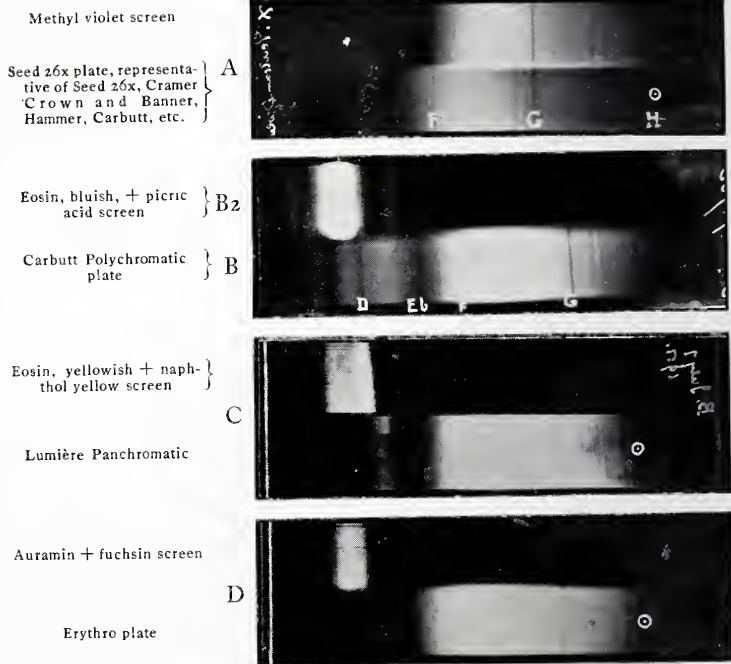
The method is as follows: Having chosen the plates of approximate equality, and which when examined by transmitted light show no imperfections, such as opaque spots or holes in the film, proceed to fix out the silver salts in the usual way, using a clean or fresh solution of hypo. If any opalescence should remain visible after fixation, proceed to clear by the use of Howard Farmer's ferrocyanide of potass and hypo reducer, using a weak solution, and then wash well to free the film from any remaining trace of hypo. Next bathe the plates for five minutes in a 40-per cent solution of formalin, and again wash thoroughly, when the plates may be reared up to dry, or the staining proceeded with at once, as preferred.

To Make the Red Filter Take 8 ounces of distilled or carefully filtered water and add sufficient picric acid to form a saturated solution (48 grains) when the temperature is raised to about 150 degrees F. (scalding heat). Now add 32 grains fast scarlet* and when dissolved, 20 to 30 drops glacial acetic acid, and again filter carefully. While still hot, empty into a glass or porcelain tray and, having a watch at hand, introduce one of the fixed and washed plates. Keep the warm solution in constant motion with a rocking movement, as in developing, for one minute, then remove the plate from the dye-bath and give a rapid

*Fast scarlet may be obtained at any drug store in 10-cent packages as "Diamond Dye fast scarlet for wool."



WINTER DAYS
R. E. Schouler



A, B, B₂, C and D of FIG. 3



{ Erythrosin+naphthol yellow screen

E

Lovell C. D. plate



Lovell C. D. plate

F

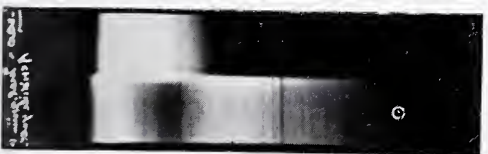
{ Magenta red + picric acid screen



Cramer Inst. Iso. plate

H

{ Picric acid + methylen blue screen



{ Acridin yellow+malachite green screen

H₂

Hammer plate

E, F, H and H₂ of FIG. 3

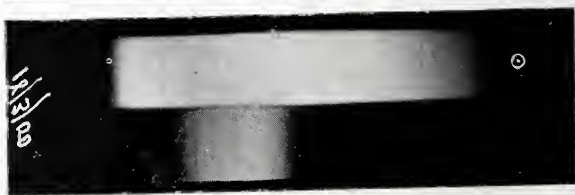


FIG. 4 (top): FIG. 5 (center): FIG. 6 (bottom)

rinse in running water, swabbing off the surface of the film with a tuft of absorbent cotton, then rear in a *warm* place to dry.

The result will be a reddish orange screen very translucent, which, if bathed for the above time in a bath compounded as described, will transmit the entire red and yellow rays (from A to D+) but effectually stopping out everything beyond. For the completion of this filter it is necessary that a second plate, reserved as a cover, should also be stained, this time in a saturated solution of picric acid in water and put aside to dry. This second staining merely serves to render more certain the total elimination of the violet and ultra-violet rays under continued light action. When both plates are dry, all that remains is to cement them together with a solution of "dried Canada balsam" in benzol or chloroform, a small pool of which is poured upon the center of the gelatine surface of the yellow glass, and the orange screen *slowly* lowered upon it. If carefully performed, the balsam will flow onward before the gradual lowering of the upper plate in an even wave, and ooze out at the edges. The only secret of success in thus cementing the plates together is to use plenty of balsam, and avoid haste in the lowering of the upper glass. Set aside to dry, and in a few days the surplus balsam can be scraped away and the edges bound as in the usual manner of binding lantern-slides.

Making the Green Filter The next point to be considered is the green screen, and this is the most important of the three. In this case there are also two baths, the first of which is composed of cold distilled water, 8 ounces; methylen blue*, 16 grains. The dye dissolves readily in the water and *after* filtration forms a clear and perfectly transparent solution into which is introduced another of the prepared plates, and bathed, with constant rocking, for a period of 30 seconds, then swished face downward in a tray of clean water for 10 seconds and put aside to dry.

The companion cover-plate to this green is bathed in water, 8 ounces; metanil yellow, 8 grains; ammonium

*Dyes from the Bausch & Lomb Optical Co., Rochester, N. Y. Purchase in form of dry powder or crystals, never in solution.

picrate, 32 grains, for $1\frac{1}{2}$ minutes, rinsed, and when dry cemented together with the green plate in the same manner as described for the red filter.

Although the purpose of this filter is Making the Blue Filter to aid in obtaining a negative solely by the action of the blue and blue-violet rays, there are many varying colored dye-stuffs, which when used with the proper plate, will result in that action even although their hue by transmitted light be almost anything but a blue, and I have used with success both a green and a magenta screen. In the present case, however, the bath is made up with B. & L. methyl violet, 12 grains; water (cold), 8 ounces, and the plate is bathed therein for the space of 30 seconds. The remaining cover-plate is *not* stained, but cemented together upon the violet, when dry, as already described, the coating of gelatine which is allowed to remain on the glass serving the purpose of keeping all three screens of equal thickness, thus ensuring absolute registration.

A color-filter may be used in either of Position of the Filters four positions: In front of or behind the lens, between the lens combinations at the diaphragm slot, or immediately in front of the sensitive plate. The first two positions present no advantage between themselves, either being used as is found most convenient for the operator, but in such positions they require to be of the best quality of workmanship and perfectly parallel in their faces. When used between the lenses they must be coated on a very thin material, such as Russian mica; while in the remaining position, viz:—immediately in front of the sensitive plate, the filters may be of a very poor quality of glass indeed, but must of course be much larger than those which cover only the aperture of the lens, besides requiring to be very evenly stained. This latter position is one which is much in favor in many of the commercial process houses. Personally I prefer the position before or in front of the lens, as being easy to get at in the changing for the different negatives—a simple carrier being made to hold the filter in that position.

The plates selected for use for the three filters are as follows:—Red filter, Carbutt polychromatic; Green filter, Seed's L Ortho; Blue filter, Carbutt Process, or Cramer Banner. The Carbutt polychromatic plate is sensitive to all colors extending from C to H⁺ (B Fig. 3), and could be used for the record of all three color sensations, provided that the filters were adjusted for that purpose and to that plate.

Much has been said in commendation of the idea of one plate for all three, but just as much has been said against it. To my mind the idea is not feasible, for the reason that the filters require to be made so dense in order to cut off the entire range of colors other than what is wanted (the plate being sensitive to all) that the time of exposure is greatly lengthened, beside which I have never found the resultant negative so crisp and clear as those obtained by the use of separate plates suited to each screen.

The exposures necessary through the three different filters are: blue 1, green 5, red 12. For example, suppose that the exposure through the blue filter is represented by 30 seconds, then the green filter will require 2½ minutes, while the exposure through the red filter will require 6 minutes. This time can be somewhat modified and shortened by a judicious use of the diaphragms, using a larger opening for the more lengthy exposures, thus admitting more light to the plate. Of course, owing to the length of time elapsing between the commencement of the first exposure to the conclusion of the third, one must exercise great care that no movement takes place, either in the subject or the camera. For this reason the instrument must be firmly clamped down to the tripod or camera-stand before beginning.

In focusing, care must be taken that allowance is made for the thickness of the filter, either by adjusting the focus through the green screen or through a "dummy" filter, of cemented unstained glasses.

The three plates being properly loaded into their respective plate-holders, ought to be plainly marked

with the corresponding screen-colors as follows:
 1. Blue—Cramer Banner; 2. Green—Seed L Ortho;
 3. Red—Polychromatic, thus preventing any error.
 The blue filter being in position, the first exposure is made and the plate-holder carefully changed, together with the filter, and the green exposure now made, the plate-holder and filter again changed and the concluding plate (the red) exposed.

Upon this head little need be said, Development otherwise than to observe that great care must be exercised, that equality of development be aimed for, and, therefore, the Watkins' factorial or time system is the only reliable method for use. As complete working details of this method have already appeared in *THE PHOTO-MINIATURE*, No. 34, it is unnecessary to repeat them here, merely suggesting that the developing agent giving the best results in the hands of the writer is pyro,—with the following formula:

Stock: I. Sodium sulphite (Seed's) dissolved in water to test Beaume hydrometer 17, 4 ounces; citric acid, 15 grains; pyro, 120 grains.

Stock II. Water, 4 ounces; potassium carbonate, $\frac{1}{2}$ ounce.

For use take of No. I, 120 minims; of No. II, 120 minims; water, 2 ounces; 10-per cent solution of potassium bromide, 5 minims.

The kind of negative to be aimed for is one which is full of detail, but without fog or hardness, inclining (if anything) to thinness, a negative similar to that required for Aristo paper. Fix in the following acid hypo bath which acts as a clearer: Water, 10 ounces; hypo, $2\frac{1}{2}$ ounces; sodium bisulphite, 120 grains.

The next operation to be considered Sensitizing the Films is that of the preparation of the film for making the positives. For this purpose I can recommend that manufactured by the Eastman Company for use in their many cameras, as being very well suited, both for evenness of coating and thinness of the celluloid support; so that the three films when superposed measure only about $\frac{15}{1000}$ inch, a thickness insufficient to cause doubling or blurring, either in the

form of lantern-slides or transparencies. The film is unrolled, in ordinary gas or lamp-light, and three pieces sufficiently large are then cut off. The sensitizing bath is compounded of a 2-per cent solution of bichromate of ammonium to which is added a few drops of ammonia. The solution will keep good for at least three weeks but should be filtered each time before using.

This solution is contained in a clean glass or porcelain bath at a medium temperature (70° F) and the first piece of cut film slipped under the solution face down. When completely submerged turn face up and gently go over the surface with a small wad of absorbent cotton to remove any air bubbles which may be adhering. The film has a tendency to curl slightly, but the operation presents no difficulty. At the end of three minutes remove from the bath, and lay *face down* on a clean sheet of glass previously wetted with the solution. A scraper squeegee is now passed lightly over the back to expel the surplus solution from between the glass and the face of the film and it is then pinned by the four corners, face up, on a board and placed in a dark-room or closet to dry. These operations are gone through with each piece singly—never attempt to sensitize more than one piece in the bath at the same time.

The film should dry at normal temperature, any attempt to hurry the drying by the use of heat will simply result in insolubility of the entire gelatine film.

The next consideration is the printing

Printing from the three-color record negatives upon the film as just sensitized, and before beginning this the negatives are edged with strips of thin tinfoil, or the edges are painted with an opaque solution to give a "safe-edge" for about one-eighth or one-quarter inch around. Next, in ordinary gas or lamp light, the film is taken and the celluloid surface cleaned from any traces of the bichromate solution which may have dried thereon, and placed in contact with the negative in the printing frame with the *celluloid surface in contact with the face of the negative*.

This printing through the back of the film is necessary in order that the after-process of development may be performed with ease. Before beginning the printing

mark the edges of the negatives so that they may be readily identified in the after-processes, as blue 1, green 2, red 3.

Use a good pressure in the printing frame to ensure absolute contact. The time of printing will vary from about thirty seconds in the sun to eight minutes in the shade, and for certainty of future results should be performed by a sensitometer. Some idea may be obtained by the appearance of the positive during the printing by examination in artificial light, and the detail should show fairly well on the celluloid surface—very much the same as in platinum printing.

When sufficiently printed, place the films between the leaves of a book, and begin preparations for development as soon as possible. If left undeveloped for any length of time the process is rendered difficult, and perhaps impossible owing to the continuing action of light in a bichromatized film, which gradually renders it insoluble—just as it does in carbon printing.

Prepare a tray, or other flat dish, with a quantity of tepid water, into which place the three exposed films and allow to remain so that the unaltered bichromate may be washed out. Next remove one film to another tray in which there is a quantity of slightly warmer water. From now on, all operations can be performed in ordinary daylight—the film being entirely insensitive while wet.

Lave the water over the gelatine surface of the print (which is conveniently held on a small sheet of glass) and it will be noticed that the picture swells first into strong relief and then begins to peel, or wash off, in patches. Increase the temperature of the water until the print is perfectly clear and clean, constantly laving the water thereon, but never touching the surface even with the most delicate touch by cotton or other means. Allow the heat of the water to do the work even should it be found necessary to use it at scalding heat. If properly printed a temperature of about 110° to 140° F. will be sufficient to complete the operation, while if overprinted it may run up almost to boiling point. Wherever the light has acted the gelatine has been

rendered insoluble in varying degrees according to the varying densities in the negative.

**Fixing and
Clearing the
Positives**

When the first print is sufficiently developed throw it into a dish of clean cold water and proceed with the remaining two, until all three are finished, and the result is three positives on celluloid composed of insoluble gelatine containing silver salts and of the usual creamy color.

To remove the silver salts it is only necessary to place the positives in an ordinary plain hypo bath to which is added a small crystal of red prussiate of potash, to assist in clearing the image. They will fix out rapidly, and when completed should be washed thoroughly in running water in the usual manner, and then may either be stained with the dyes at once or hung up to dry for future completion.

**Staining the
Positives**

The dyes necessary for this purpose are 1. Methylen Blue; 2. Ammonium Picrate; 3. Magenta Red. The positive made from the negative marked Blue No. 1 is stained *yellow*; that from No. 2 Green, is stained *red*; while the last one marked Red No. 3 is stained *blue*. The reason for this apparent anomaly will be explained presently.

Take of ammonium picrate, sufficient to saturate 4 ounces of water. After the dye has dissolved and the solution has been filtered into a clean tray, immerse the print marked No. 1 (from the blue screen negative) and allow it to remain until the gelatine is completely saturated with the dye. Then remove and rinse in clear water which has been acidulated with acetic acid. This acid bath assists in fixing the color in the gelatine and clearing the celluloid. Now lay the yellow positive upon a sheet of glass (face down), and immediately proceed to prepare the red positive. This is done in a solution of magenta red, 16 grains; hot water, 4 ounces; acetic acid, 10 minims, into which is placed the transparent positive marked Green No. 2, and handled similarly to the yellow as just described.

Then the blue bath is prepared as follows: Methylen blue, 16 grains; cold water, 4 ounces, and the re-

maining print (Red No. 3) is stained therein, fixed and rinsed.

We now take the piece of glass which bears the yellow positive and superpose upon it the positive in red, manipulating it gently with the fingers until *approximate* registration is obtained; then superpose upon these two the positive in blue.

This will give a rough but fairly good idea of the appearance of the finished color record, and will show at a glance whether the red or blue has been under- or overstained, and if so the remedy is obvious. Finally, when all appear to be correct, the films are separated and pinned face up upon a board to dry.

**Mounting
the Finished
Positive**

There are two methods. First, to mount the films by cementing them together between two cover glasses, or, second, to mount them dry. I have used both methods, but fail to find any difference in the result as shown upon the screen or by viewing as transparencies, for which reason I unhesitatingly recommend the latter as offering less trouble than the first. Proceed as follows: Clean off the celluloid back of each film from any trace of the dye and center the yellow positive upon a clean cover-glass, fastening it in position by small pieces of lantern-slide binding.

Next take the positive in red and carefully move it into exact registration with the yellow, and when adjusted fasten that also in the same way. Finally the blue positive is superposed upon the first two, the object "matted," covered and bound. Provided the directions given have been carefully followed, the result will be a reproduction of the object photographed in all its varied shades and tints—perfectly translucent, and showing a purity of color which makes the transparency a marvel of beauty. This completes the operations necessary to obtain a photograph on glass reproducing an object in the natural colors.

**Further
Considera-
tions**

The care necessary in the development of the color record negatives cannot be overestimated, and it is well that an additional word should here be given. The usual method of guessing at the exposure

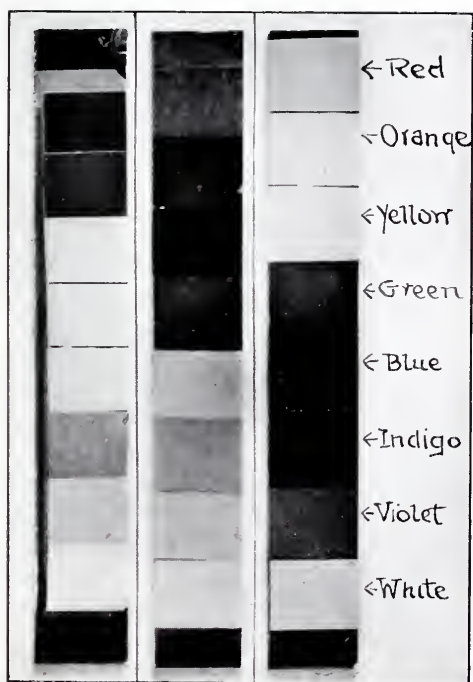


FIG. 7



FIG. 8
Violet screen: basis of print
in yellow

FIG. 9
Red screen: basis of print
in blue

FIG. 10
Green screen: basis of print
in red

and then developing until the operator guesses the result is "about right" is altogether unsatisfactory in color work, and will surely result in falsity of the color records.

Suppose, for example, that the red negative (green screen) is slightly underexposed, and overdeveloped to force up the detail in the shadows, what is the result? All the lighter shades of red will be clogged up and rendered too opaque in the negative, so that, after printing the positive and developing it, the gelatine will be almost entirely washed away from those portions, thus leaving but a modicum to absorb the stain. In a case of overexposure and consequent underdevelopment the reverse is the case, viz., the delicate tints are too deep and the shadows too light in the finished result.

A very good plan, first advanced by Abney, is to incorporate in the negative a small square of neutral grey color (a piece of platinum paper exposed and developed to a medium tint is excellent) so that it will appear on the edge of each of the three primary negatives, and adjust the exposures until by similar development, the grey shows as a patch of equal density on each. "Do not alter the development factor but change the exposure." (Watkins.)

It is evident that the nearer the various steps of the process can be brought to mechanical exactness the better, as eliminating chances of error. For this reason I counsel the adoption of a simple exposure-meter or photo-meter as conducing to that mechanical precision which is so desirable.

It consists simply of a number of small squares of colorless tissue paper, each succeeding section is just one sheet thicker than the one preceding it—twelve in all, arranged upon a $3\frac{1}{4} \times 4\frac{1}{4}$ glass, to which is hinged an opaque back. Each square is plainly and consecutively numbered 1, 2, etc. Solio paper is used in this instrument because of its uniformity, and the instrument is placed facing and in the same light as the object photographed, at the same moment that the plate is uncovered. If trial proves that a plate (say the blue) is correctly exposed when the paper upon examination shows 3 as the lightest number visible, then the time necessary to print up to that number under varying

conditions and strength of light is the correct time for that plate, with that diaphragm, upon that class of subject. The same applies to the remaining two negatives.

About
Subjects And now a word regarding the class of subject photographed. Owing to the necessity for three exposures, it will be apparent that still life objects offer the best field for experiment until the tyro gains confidence and skill in the handling of the screens. However, on a still day a landscape presents no particular difficulty, if care be taken that the camera is not moved, even in the slightest. The light, spider-legged tripods so much in use now are utterly worthless for this work.

Landscapes will, of course, require the shortest exposure, then in order following comes water-color paintings, still life objects, and oil paintings, these latter requiring the greatest length of time. The exact relative lengths of the three exposures can only be found by test, for minute differences in the depth of the color-screens (which in the above method of manufacture is unavoidable) will alter these relations slightly.

Liquid
Screens Liquid color screens are preferred
Preferable and generally used by more advanced operators in laboratory and scientific work, as offering greater scope for variations needed for any special subject, while the liquid presents a perfectly even and homogeneous layer of color of higher luminosity than any dry filter which it is possible to manufacture. For the first experiments, however, the film screens described will be found more convenient to use.

Faking Color
Negatives Although it is not advisable to "doctor" or "fake" any color negative, as such a course undeniably results in the alteration of the color scale, yet it is sometimes necessary with some particular subject which the operator is desirous of possessing, and of which two negatives are practically perfect. For example, let us suppose that the red negative is too hard and dense in the high lights owing to slight underexposure and subsequent overdevelopment. Such a defect is best remedied by the use of persulphate of ammonium which, as is well

known, acts upon the dense portions of a well-washed negative as a strong reducer, but without in any way altering the delicate detail of the shadows. Similarly in the matter of intensification, the best method to use when the negative is somewhat thin and flat (slightly overexposed) is the usual bichloride of mercury followed by blackening with sodium sulphite. On the contrary, if the negative presents excellent gradation, relatively correct, but too thin generally, the best course to pursue is to strengthen it with the intensifier suggested by Lumière, viz., iodide of mercury plus sodium sulphite, which acts equally all over the plate. Remember that the reduction and intensification methods act merely as make-shifts to be avoided if possible. Let the golden rule of color work be :—Expose and develop so that the results may be an equal amount of deposit on the whites, or neutral grays in each of the three negatives.

In the printing of the positives upon the three films there is not much chance to correct overexposure, and it is much more satisfactory to throw the print away and make another. In cases of underexposure one can save the print by handling carefully in tepid water and increasing the temperature very gradually.

There is another method in use by some operators, who use only two specially prepared films and make one of the positives upon a lantern-slide plate which is converted into the blue print by displacing the silver image by one of iron, a modification of the well known "blue print" method. I cannot recommend this method to the beginner, because of the difficulty of obtaining the exact depth of color, this depending solely upon the exposure, so that usually several blue plates have to be made before a successful one is secured. For this reason, it is very much safer to use the film, as the color can be washed out to a greater or less extent at will. Again the luminosity transmission is not as perfect as with the dye method, nor is the hue as good.

But, it may be asked here, why is
 An the violet negative printed in *yellow*
 Explanation the green in *red*, and the red in *blue* ?
 The reason is very simple.

In a black and white subject there are two parts complementary to one another, which are, white paper for one part, and white paper covered more or less with a black pigment for the other part. A negative of this subject will also consist of two parts respectively, opaque and transparent, the opaque parts corresponding to where the light has acted, and the transparent portions representing the black pigment, or where there has been no light action.

When a print is made from such a negative the materials are, white paper and a pigment which will absorb white—black. The transparent portion of the negative prints this color, while the opaque portions have no part (that is, no active part) in producing the print. Thus it may be said that the negative is made by *white* but prints in *black*, viz: the complementary color. In reproduction, therefore, from color negatives the synthetical or building up color of the positive is complementary to the part (or color) which photographs.

Provided that the instructions given for the preparation of the three filters have been carefully followed, they will present a close approximate to the results shown in Figs. 4, 5 and 6, which indicates plainly the action upon the spectrum. The red filter in this case (Fig. 4) was used upon a plate sensitized by the writer some time before the introduction of the Carbutt polychromatic, and is sufficiently good to show the action in the red and orange. The longer spectrum shows the *unscreened* action of solar light upon the plate, while the shorter spectrum immediately above and in close register with the other, shows the action of the light when filtered through the screen, with increased exposure. The action of the remaining filters is respectively shown in the remaining two spectra.

It must of course be understood, that although a set of filters may fulfil all the requirements of a spectroscopic test, yet this is not at all times sufficient, because the colors that are used synthetically (to build up), are not themselves always pure. This is more particularly so in regard to the practice of three-color work which has to be reproduced through the medium of printer's

ink, for at the present writing absolute purity, combined with transparency, is impossible of achievement, if any consideration at all has to be given to permanency. Therefore the inks now made are not theoretically correct and only two of them are transparent. For this reason the yellow is always printed first, because opaque, followed by the red and blue.

**Selective
Action of
Filters**

That the selective action of the three filters may be more definitely understood there is shown in Fig. 7 three reproductions from negatives taken through the screens as prepared according to the foregoing instructions. They are plainly marked and show for themselves their particular absorption. The object photographed is a slip composed of seven colors and a white forming an artificial spectrum. Each of the color squares are printed from solid blocks in standard color inks, the individual colors of which are indicated by name in the illustration.

**Three-color
Negatives**

To the beginner in color work the first sight of a set of three-color negatives is always more or less disappointing, for the reason that he has unconsciously prepared his mind for the observation of the three negatives which will present vast differences in their appearance, but this is very rarely so. The writer has had unmarked sets of negatives "mixed" and it was only by the closest observation that they could be determined. The reason is obvious, if given but a moment's thought, viz, the fact that the object photographed did not reflect pure colors, but mixtures. There may have been a brilliant yellow, for example, but yellow reflects not only yellow but also red, orange, green, and in the majority of cases, a small quantity of blue, hence it is impossible that the action be confined to one particular plate, to the exclusion of the other two. (See plates 8, 9 and 10).

With reference to the subject-matter of this little monograph, the writer lays no claim to originality of method. He has made free use of all the sources of information at his command, and the names and works of those physicists to whom the science is most deeply

indebted are given in the bibliography following, in order that the student may bring himself into closer touch with the principles of light and color, which render possible better photographic color work, the better they are understood.

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ADVANCED STUDY IN LIGHT

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DYES

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R. JAMES WALLACE.

In *Photography Annual*, 1897, Thomas Bolas gives a valuable paper, first prepared for the Society of Arts, London, entitled, "Contributions to a Bibliography of Photography in Colors." A similar contribution appeared in the journal *Photography* some years later—in 1899 or 1900.

EDITOR.

NOTES

It will be remembered by our readers that, as soon as the St. Louis World's Fair of 1904 was arranged for, Mr. Julius C. Strauss, of St. Louis, urged upon the exposition authorities that photography should be recognized as an art and, as such, given place in the Department of Fine Arts. His suggestion was warmly received by President Francis and enthusiastically endorsed by photographers in this country and abroad.

When the classification lists were published, however, it appeared that photography was designated as "Group 16: Photography—Equipment, processes and products," being given place in the Department of Liberal Arts along with Typography, Books, Maps, Philosophical and Medical Instruments, Theatrical Appliances, Architectural Models, etc. This classification naturally aroused intense opposition throughout the photographic world. It was plainly asserted that, under such conditions, the principal pictorial photographers, whether amateur or professional, would refuse to exhibit their work or support the exhibition. As a natural consequence of this it was pointed out that photography would be inadequately represented at the exposition. In *Wilson's Photographic Magazine*, *The International Studio*, and almost every other journal connected with photography protest after protest was made. Supported by many prominent photographers, Mr. J. C. Strauss organized an active campaign intended to reverse the decision of the exposition authorities, and to win for photography the recognition it deserved as a fine art. Meetings between photographers and Col. J. A. Ockerson, of the Department of Liberal Arts, were arranged, and other steps taken to arouse public opinion.

We are glad to record the success of the campaign so energetically carried through on Mr. Strauss's initia-

tive. Herewith, by the courtesy of Mr. Edward L. Wilson, we publish a letter recently received from Colonel Ockerson, together with Circular No. 5 (omitting purely architectural description of the buildings) issued by the Department of Liberal Arts of the exposition. The importance of the matter seems to justify this course. It will be seen that the exposition authorities have made a large concession and that a selected exhibit of pictorial photographs will be given place in the Department of Fine Arts.

The readers of *THE PHOTO-MINIATURE* are urged to lend their practical support. We especially invite expressions of opinion concerning the representation of photography on the present basis. It is peculiarly desirable that the authorities should be informed as to the size of the display of photographs which will be made on the condition that the display is placed in the Art and not in the Liberal Arts Building. Correspondence on the subject may be addressed to Mr. J. C. Strauss, St. Louis, or to this magazine, wherein space will gladly be given for its discussion.

(Copy of letter addressed to MR. EDWARD L. WILSON.)

Editor: Wilson's Photographic Magazine,
New York City.

DEAR SIR:—In your April issue you gave considerable space to the subject of photography at the St. Louis World's Fair, which I was glad to see.

As my position in regard to the recognition of artistic photography has been misunderstood, kindly permit me to make a brief explanation.

The classification was adopted by the Louisiana Purchase Exposition Company and approved by the National Commission before I became connected with the Department of Liberal Arts. Under these conditions, my efforts were directed toward providing an acceptable place for the work of the photographer in the Liberal Arts Palace. My own high estimate of artistic photography naturally led me to feel much gratified that this attractive work had been assigned to my department, and I was glad of an opportunity to offer

a specially prepared space in one of the most attractive palaces of the exposition for the display of this class of work.

After a great deal of careful consideration on the part of Prof. Halsey C. Ives, Chief of the Department of Art, and myself, an agreement was reached whereby artistic photography of special merit may be hung in the Palace of Art, as far as space will permit.

The manner of selection, etc., is set forth in detail in my Circular, No. 5, enclosed herewith, which I hope may find space in your columns.

My earnest endeavor will always be to give all of the exhibitors of my department every possible facility for a satisfactory display of their exhibits, and in return I trust that they will accord to me their cordial support.

Personally, I feel confident that the erection of a special "Art Building" for photography would be a grave mistake and a disappointment to its advocates. It would be dwarfed by the gigantic palaces which surround it, and while it might attract photographers, the great mass of people, whom I assume should also be reached, would see little or nothing of it.

Aside from this, I beg to say in conclusion that the chiefs of the Department of Liberal Art and the Department of Art have, from the beginning, been favorable to a proper recognition of artistic photography, the question of space available in the Art Palace being the chief element of doubt as to the placing of such exhibits.

Trusting that our exposition may be favored with the hearty support of your valuable magazine, as well as the photographic fraternity generally, I beg to remain,

Yours very truly,

J. A. OCKERSON,

Chief, Department of Liberal Arts.

UNIVERSAL EXPOSITION, ST. LOUIS, U. S. A.
Department of Liberal Arts.

Circular No. 5.

The anniversary of that important historic event, the acquisition of the Louisiana territory, will be cele-

brated in St. Louis by a universal exposition, embracing exhibits gathered from every field of human endeavor, both at home and abroad, which will illustrate to the fullest practicable extent the developments of a century in art, science and the industries.

The national and international scope and character of the exposition is fully set forth in the organic act of March 3, 1901, in the following terms:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That an exhibit of arts, industries, manufactures, and products of the soil, mine, forest and sea, shall be inaugurated, etc. The President shall be authorized to make proclamation of the same. And he shall, in behalf of the government and the people, invite foreign nations to take part in the said exposition, and to appoint representatives thereto."

It is also voiced in the proclamation of the President of the United States, issued August 20, 1901, under the above authority of Congress, who, in the name of the government and the people of the United States, invited all of the nations of the earth to take part "by appointing such representatives and sending such exhibits to the exposition as will serve to fitly illustrate their resources, their industries and their progress in civilization."

The exposition will occupy a beautiful site, covering about 1,000 acres in area in and adjacent to Forest Park, in the central-western part of the city.

The opening date has been fixed on May 1, 1904, and the closing date on November 30, following.

At the inception of the work, the designing of the buildings and the embellishment of the grounds was assigned to a commission composed of some of the leading architects and landscape engineers in the United States, and the results will undoubtedly be such as to win the enthusiastic admiration of all visitors. By means of colonnades and inner courts they have made special provisions for shade and coolness throughout the exhibit buildings.

The Department of Liberal Arts will occupy an

entire building, covering an area of about 400,000 square feet, and all exhibits will be on the main floor. It is the most easterly of the main exhibit buildings and is near the United States Government Building. It will be built of steel at an estimated cost of \$500,000. Although following the prevailing style of architecture of the exposition—the Renaissance—it adheres very closely to classic lines.

The building is to be constructed without interior columns, the exhibit space being spanned in one truss. The internal court can, if necessary, be used as an overflow exhibit space. The exhibit space is adapted to any kind of exhibit, and the building will be ventilated and lighted by an abundance of windows, both in the exterior walls and in the clerestory.

Diligent efforts will be made to fill this building with attractive and interesting exhibits of products and processes of the highest types of the various arts and industries of today from all parts of the world, and at the same time illustrate their evolution by showing some of the products and processes of the earlier days.

Your earnest coöperation is solicited, and you are cordially invited to submit plans and specifications for exhibit space in this department in one or more of the groups of the following classification:

- Group 15. Typography—various printing processes, equipment, processes and products.
- Group 16. Photography—equipment, processes and products.
- Group 17. Books and publications—book-binding—equipment and products.
- Group 18. Maps and apparatus for geography, cosmography, topography.
- Group 19. Instruments of precision, philosophical apparatus, etc.; coins and medals—equipment, processes and products.
- Group 20. Medicine and surgery.
- Group 21. Musical instruments—materials, processes and products.
- Group 22. Theatrical appliances and equipment.

Group 23. Chemical and pharmaceutical arts—equipment, processes and products.

Group 24. Manufacture of paper—raw material, equipment, processes and products.

Group 25. Civil and military engineering.

Group 26. Models, plans and designs for public works.

Group 27. Architectural engineering.

Each of the above groups is divided into several classes.

Group 16, relating to photography, its processes and products, is further described in the following pages :

GROUP 16—PHOTOGRAPHY

Equipment, processes and products

Class 54. Materials, instruments and apparatus of photography, equipment of photographic studios.

Class 55. Negative and positive photography on glass, paper, wood, cloth, films, enamel, etc.—photogravure in intaglio and in relief; photocollography; photolithography; stereoscopic prints; enlarged and micrographic photographs; color photography, direct, indirect; and photo-color printing; scientific and other applications of photography; artistic photography as applied to portraiture, landscapes, etc.

This group embraces the equipment, processes and products of photography in all its branches.

Photography will here find an attractive home, amid congenial surroundings filled with displays of the graphic arts, music, the drama, civil engineering, architecture, etc.

Special provisions will be made for the display of selected high-grade examples of artistic photography.

Admission to this class will be confined strictly to such art work in photography as may satisfactorily pass the critical inspection of the National Jury of Selection of the Department of Art.

The pictures from United States exhibitors which are

thus admitted shall be hung in the United States section of the Art Building to such an extent as the room available will permit.

The pictures from foreign exhibitors will be admitted under similar rules, but must also, in all cases, conform to the rules of the respective foreign sections to which they belong, as to whether they can be hung in the foreign section of the Art Palace or not.

A suitable, attractive space will be specially prepared in the Liberal Arts Palace, where pictures selected in accordance with the above rules may be properly displayed in case they do not find suitable space in the Art Building.

Under this system there should be gathered such a fine array of artistic photographs as will merit the admiration of art connoisseurs and win the plaudits of artists of the older schools of the brush and pencil.

The very large number of professional and amateur photographers in all parts of the world who are daily producing pictures of a high order will doubtless gladly lend their aid in gathering a most interesting and valuable display of their work.

The latest developments in color-photography in all its phases should be freely treated, as also the scientific applications of photography to astronomy, surveying, etc.

The photo processes also afford a fine field from which to gather attractive exhibits.

All classes of cameras and their appurtenances will find a suitable place in this group.

It would also be very gratifying to have examples of the work done and the cameras used by Wedgewood and Davy, Niepce and Daguerre, and others of the earlier workers, to show the progressive steps of this wonderfully fascinating art.

The specific mention of certain features of the several classes are simply suggestions, which can readily be amplified by similar treatment of every item in the classification.

The rules and regulations of the exposition accompanying each application blank should be carefully considered before filling out requests for allotments

of space. These must, in all cases, conform strictly to said rules and regulations.

In the preparation of exhibits it should be borne in mind that the best interests of the exhibitor, the visitor, and the exposition require that no effort should be spared to make the exhibit attractive in its arrangement and in its movement, and special processes should be shown whenever it is practicable.

While as liberal allowances of space will be made as are found to be practicable, exhibitors should restrict themselves to as few well-selected examples of their products as permissible with due regard to the creditable display of the best features of their work rather than attempt to make an exhibit attractive through its magnitude.

There will be no charge for space occupied by exhibits, and a liberal amount of power for the operation of mechanical devices, to illustrate processes of special interest, will be furnished to exhibitors gratuitously.

Any further information desired will be promptly furnished on application.

An early response to this circular will be appreciated.

J. A. OCKERSON,
Chief, Department of Liberal Arts.

We are asked to notify those interested in the Speed-List of American plates for use with Wynne's Exposure Meter, that Mr. George F. Wynne, of Wrexham, England, may be addressed during the month of July in care of Henry Wenzel, Jr., 237 South 4th street, Brooklyn, N. Y.

There have been so many inquiries made concerning the Wynne Meter and the speed-listing of American plates that we feel sure many of our readers will be glad to communicate direct with Mr. Wynne.

Catalogue No. 103, for amateur photographers, just published by H. A. Hyatt, 410 North Broadway, St. Louis, Mo., is a good example of the photographic

catalogue as it should be done. The apparatus and supplies listed are described in an interesting rather than in the usual stereotyped way, and the illustrations are well chosen and carefully printed. No amateur who desires to be fully informed about the new season's goods should be without this catalogue, a copy of which can be had by sending a two-cent stamp to the publisher.

We note an error in listing THE PHOTO-MINIATURE, wherein the price is said to be \$1.25 instead of 25 cents per copy. The error is obviously a misprint.



Mr. S. C. Workman, of Torrington, Conn., writes: "I note the list of plate-speeds given in THE PHOTO-MINIATURE for use with the Wynne Exposure Meter. As I seldom use these meters, the numbers given are of little definite use to me, but I would like to know the relative speeds of plates of different makes. Will you advise how to convert the speed numbers given in the table into direct speed ratios?"

To this Mr. Wenzel replies. Briefly the ratios of the speed numbers may be taken as follows:

F128	=	1
111	=	1½
90	=	2
78	=	3
64	=	4
56	=	6
45	=	8
39	=	12
32	=	16
28	=	24
23	=	32
20	=	48
16	=	64
14	=	96
11	=	128



Burke & James, 118 West Jackson Boulevard, Chicago, and 110 Fifth avenue, New York, send us an

unusually interesting catalogue of their specialties. Although familiar with the enterprise of this well-known firm, we were pleasantly surprised by the remarkable display of conveniences and materials made in this catalogue. There is no dead stock listed; all the items are in line with the needs of today. The Ideal and Ingento specialties deserve special mention as offering splendid values. Among the novelties we notice *Isochrom*, a new ray filter accurately adjusted for Cramer Iso plates, and the *Isochrom Safe Light* for developing isochromatic plates. A copy of the catalogue can be had for a 2-cent stamp, and we can promise a profitable half hour to those who get a copy.



The Cleveland (Ohio) Camera Club was organized on June 5, at a meeting of photographers held at the Case Library. The club was originated for the advancement of artistic photography, and makes no distinction between professional and amateur workers. In issuing invitations to join the organization the promoters endeavored to ask only those who held the interests of the art at heart.

It is the intention of the club to hold two meetings monthly, at one of which a discussion of some artistic or scientific phase of the photographic field will be discussed. At the other will be held a members' print exhibit under the control of a print committee. It is anticipated that the friendly criticism that these monthly exhibits will bring forth will be of inestimable value to the members and will encourage new workers, and make for that growth and development so necessary to advancement in the art. At present the club has forty active and two honorary members.

The officers are George M. Edmondson, president; Dr. A. H. Marvin, vice-president; William T. Highbee, treasurer, and A. C. Bates, secretary. In the fall commodious club rooms will be engaged and properly furnished for the use of the members. Until such time as the club is permanently located in its own rooms, communications should be addressed to A. C. Bates, secretary, 309 Garfield Bldg., Cleveland, Ohio.

The question of mounts for photographs is one which perplexes photographers everywhere. No matter how desirable the print may be in subject or treatment, the choice of a suitable mount will enhance or destroy these attractions. To those in perplexity we recommend the investment of ten cents in the new illustrated catalogue of 1902 cards issued by Taprell, Loomis & Co., 420 Dearborn street, Chicago, or 1123 Broadway, New York. In this display almost every fancy may be indulged, whether for professional or amateur needs. We especially mention the Ascot panel as desirable for many needs, while for a dainty portrait the little enclosure stamped "A Study in Portraiture," and bound with red silk ribbon is most attractive. The Princeton cards made by this firm are unique in design and tasteful in effect at moderate prices.

A ray filter competition, with \$121 in prizes and other attractive features, is announced by Burke & James, of Chicago. The competition closes September 30, and the exposure in the case of each print submitted must be made through the Ideal Ray Filter or Isochrom Filter manufactured by Messrs. Burke & James. The judges will be Mr. F. Dundas Todd and Mr. R. James Wallace, of Chicago, with a third judge selected by them. The conditions of the competition are few and simple. Particulars may be had from Messrs. Burke and James, 118 West Jackson Boulevard, Chicago, or 110 Fifth Avenue, New York.

G. Gennert, New York, is placing on the market an ingenious flash lamp, known as the Lieber lamp. This has a 20-inch powder pan giving an unusually broad flame, which can be operated at a height of six feet from the ground when this is desirable. A special feature of the Lieber lamp is that it can be operated at any desired distance by simply lengthening the tube attached to the bulb. The flame is produced by exploding a common cap by bulb pressure, no flame being brought near to the powder. The lamp can be folded up like a music stand and sells at \$6.

A very attractive catalogue, well arranged and listing all the standard photographic specialties, comes to our desk from D. C. Prudden, Kansas City, Mo. Judging by this list, the amateur and professional workers of Mr. Prudden's locality will save time and trouble by calling at Mr. Prudden's well-equipped store for their needs instead of going wider afield.



As we go to press, Mr. Henry Wenzel, Jr., sends the subjoined list of American plate-speeds, as revised to date, and with the plates arranged in the order of their respective speeds. No explanation is given bearing upon the differences in speed between this list and that published in our January issue, except that Mr. Wenzel writes that this list is the result of exhaustive tests save in the case of Carbutt's plates, which are yet to be tested.

SPEEDS OF AMERICAN PLATES

Revised May, 1902, by Henry Wenzel, Jr.

American Plate	F 64	Hammer Fast	F 64
Blair Film	F 56	" Extra Fast	F 90
Carbutt's A & Process	F 10	" Double Coated	F 90
" B 16	F 20	" Special Extra Fast . .	F 90
" B 20	F 28	New American Film	F 78
" Non-Halation D. C. . .	F 32	New York Slow	F 56
" Ortho Portrait S 23 . .	F 32	" Rapid	F 78
" Negative Film	F 64	" Ortho	F 90
" Eclipse	F 64	" Non-Halation	F 90
" Eclipse Junior	F 78	" Record Extra Rapid .	F 111
" S 27	F 78	R. O. C. Plate	F 56
*Cramer's Slow Iso	F 39	Rotograph Neg. paper, Fast .	F 90
" Contrast	F 56	Seed Process	F 14
" Anchor	F 78	" S 23	F 64
" Medium Iso	F 78	" S 26	} F 90
" Banner	F 90	" All S 26x brands . . .	
" Instant Iso	F 90	" Non-Halation	F 90
" Crown	F 111	" Gilt Edge, S. 27 . . .	F 111
Eastman Film & Plate	F 90	Standard Ortho	F 90
Forbes T Plate	F 20	" Extra	F 90
" L	F 23	" Imperial Portrait . .	F 111
" S	F 78	Stanley, S. 35	F 78
" S Ortho	F 90	" S. 50	F 111
Hammer Slow	F 39		

*Both single and double coated.

As mentioned elsewhere, Mr. Wynne, with whose exposure meter this speed-list is intended to be used, may be addressed in this country for the next few

weeks. This will afford those interested an opportunity for any explanation desired.

In connection with this we would call the attention of the reader to the fact that the speed-list given on page 474 of the January issue of THE PHOTO-MINIATURE was corrected to February, 1902. The date 1901 was a typographical error.



A dainty little instrument worth the attention of readers going abroad is the new Pocket Poco Camera, made by the Rochester Camera and Supply Company, Rochester, N. Y. We have carefully examined this camera, which permits the use of plates or films at will, and cannot see wherein it could be improved in practical convenience and efficiency.



We hear much favorable report of the Thayer Flash Machine recently put forward by Mr. N. C. Thayer, 185 Dearborn street, Chicago. It will be recalled that the writer of THE PHOTO-MINIATURE NO. 29, dealing with Flashlight Photography, used this machine in his work, and spoke highly of its performance. A new circular received from Mr. Thayer tells us that the machine has been substantially reduced in price owing to the larger demand.



The Photographic Society of Philadelphia proposes to put in operation a circulating library scheme, whereby the society's fine library of photographic books can be sent to the homes of the members as desired for reference and leisurely reading.



We record with personal regret, in which many who read this will join us, the death of Dr. J. C. Millen, of Denver, Colorado, which took place a few weeks ago. Dr. Millen, well known and much esteemed in the east, went to Colorado some years ago to regain his health. For many years he devoted himself in Denver to the manufacture of his photographic special-

ties, and his health seemed to be completely restored. Latterly this desirable condition of affairs changed, and his physicians advised a change of climate. Accompanied by his devoted wife, Dr. Millen went to Texas in February, but, deriving no benefit from the trip, returned to Denver, and there awaited the end.

The business established by the late Dr. Millen will be continued under the title of the J. C. Millen M. D. Photographic Chemical Company, at Denver, Colorado.



The fourth edition of Eder's Handbook of Emulsions, published twelve years ago, has been completely revised, enlarged and brought to date by Dr. J. M. Eder. The new edition of the work will appear in two parts, of which Part I: *Die Grundlage der Photographie mit Gelatine Emulsionen* (The Basis of Photography with Gelatine Emulsions) has just been published by Wilhelm Knapp, Halle a/s. Germany @ \$2. For those engaged in the manufacture of plates and papers this work is indispensable, and we know of no work so well deserving of translation into English. Some years ago Mr. E. J. Wall made an English translation of the fourth edition, but, unfortunately, the translation remains buried in the pages of the weekly journal in which it appeared.



Alfred Watkins, of Hereford, England, has published a little book which will undoubtedly be much sought after by those who use his exposure and development systems. The book is entitled "The Watkins' Manual," and deals completely with negative-making along the lines so long exploited by Mr. Watkins.



Three Thousand Dollars for Photographs.—The Bausch & Lomb Optical Company, Rochester, N. Y., announce a photographic competition open to amateur and professional photographers, residents of foreign countries as well as the United States. The object of the competition is to bring together as representative

a collection of photographs as possible, in order that the present development of photography and the progress in lens and shutter construction which has been made during the past quarter of a century may be made evident. It is hoped that photographers will enter the competition and assist in making it as valuable as possible both to the competitors and to photography at large. In order to enhance the interest of photographers in all branches of photographic work, the awards have been divided into a number of classes, such as landscape, portrait, genre, instantaneous, architectural, interior, etc. Several special awards for telephoto and other work have been provided; also a special award for users of the Bausch & Lomb Rectilinear Lenses, on various makes of hand-cameras, kodaks, etc. A special booklet, giving conditions, arrangement of classes, awards, etc., will be mailed free on request.

Dr. R. L. Maddox, whose name will always be linked with photography by reason of his early experiments in emulsifying the silver salts in gelatine, and so preparing the way for the modern dryplate, died at Southampton May 11. His experience in photography began in 1853, so that his life practically covered the evolution of photography after the first decade had passed.

The relatively great cost of our modern anastigmats as compared with the older lenses has puzzled many workers in photography. The editor of the *British Journal of Photography* takes up the point, and says:

"Our attention is frequently drawn to the high price of anastigmatic lenses by photographers who know the shortcomings of the older types, but are reluctant to incur the expense of a new equipment. Excellent work has been done with the older types, especially the aplanat, or rectilinear, but when the photographer has to grapple with critical work he feels how important it is that his lenses and apparatus should be of the best. If we compare the catalogues of lenses by

our best opticians with the price-lists of, say, fifteen years ago, we are not surprised that there should be some demur on the part of the photographer to purchase a new outfit. The chief consideration is the price, but it would be very unjust to infer that the optician is not giving an equivalent for the addition to the cost. As a correspondent writes to us for information concerning some new lenses, and concludes with the remark, 'We have plenty of superior lenses on the market, but their prices are very high,' it may not be out of place to draw attention to certain considerations, of which the photographer may have but a faint idea, but which must be weighed in forming a just opinion of the value of the opticians' work of today. We have before us the catalogue of one of the best continental opticians, and we find the prices of the new lenses rather more than double those of the rectilinear series. What is the reason for this addition to the cost?

"To form some accurate idea of the difference in cost between the well-known rectilinear and the anastigmatic types which have hitherto been in most favor, we would first point out that the former contains but four lenses, whilst the latter is formed of six. Moreover, the anastigmatic lenses are considerably larger in size, as they work at greater intensity. Another fact which also adds to the cost is the hardness of some of the glass used in modern lenses. The grinding and polishing of such a lens is, therefore, a much more tedious process. It will thus be seen that, if we merely take the number and the area of the surfaces which have to be prepared in the anastigmatic lens the cost of production must at least be more than half as much again. Other factors have also to be borne in mind, such as the higher cost of the optical glass, the greater accuracy of workmanship and the finer mechanical adjustments. If we add to these differences in the cost of production, the remuneration of the skill of the inventor, and the cost of the many months of tedious calculation requisite to find the most suitable curves and other optical data for the lens, it will be seen that the modern instrument must of necessity be

much more expensive. On the other hand, the photographer obtains important advantages, for which he should be prepared to pay. He has a lens which will work with greater speed and greater accuracy. Subjects are brought within his range which are impossible with the older lenses, and he should not shrink from giving the optician the just reward for his skill."

BOOKS AND PRINTS

The *Photographic Encyclopedia*, 1902, published by Andrew J. Lloyd & Co., 325 Washington street, Boston, comes to our table in a handsome cover of tasteful design. Among the specially contributed articles we note: "Quick Lenses and their Application in Photography," by Dr. Paul Rudolph, Jena; "The Advantages and Ease of Telephotography," by Frank S. Dobbins; "Lantern - Slides," by Alex. B. J. Moore," and "Stereoscopic Photography." The Hints and Formulæ are as carefully compiled as ever, and the 400-page catalogue is quite as interesting as the contributed papers which precede it. The *Encyclopedia* is in every way the best volume of its class within our knowledge and, since a copy can be had by sending 20 cents to cover postage to its publishers, we are confident that most of our readers will see that they have it at hand for reference during the year.



Haslerisms is the title of a bright little paper published monthly by Hastings and Miller, at 118 Nassau street, New York. It is made up of helpful hints and miscellaneous information for free distribution. Mr. W. F. Hapgood is the editor.

Tennant and Ward's List OF NEW BOOKS AND PUBLICATIONS

THE LADY POVERTY. A XIIIth Century Allegory, telling how St. Francis of Assisi wooed and won that most difficult of all brides, my Lady Poverty. A delightful volume for all interested in Franciscan and mediæval literature. Written A.D. 1227, now rendered into English for the first time. Translated and edited by MONTGOMERY CARMICHAEL. 209 pp. Cloth. *Net*, \$1.75.

AMERICAN PICTORIAL PHOTOGRAPHY. Representative examples of the work of the American School of Pictorial Photography. Selected by and reproduced in photogravure under the personal supervision of ALFRED STIEGLITZ, and formerly published by "Camera Notes." Series I, *net*, \$10. Series II, *net*, \$6. The edition was limited to 150 copies of each series, and only a few sets are obtainable. Descriptive circular on request.

THE "CAMERA NOTES" IMPROVED GLYCERINE PROCESS for the development of platinum prints, including the experiments of ALFRED STIEGLITZ and JOSEPH T. KEILEY. Illustrated with facsimile reproductions in color, by the experimenters. Reprinted from "Camera Notes." Only a few copies obtainable. Paper covers, *net*, \$1.

AN INDEX OF STANDARD PHOTOGRAMS. Being a guide for Authors, Editors and Publishers of Illustrated Books and Periodicals, Collectors of Pictures, etc., listing photographs available for publication purposes. Sold by subscription only. Particulars on request.

PHOTOGRAPHY FOR NATURALISTS. By DOUGLAS ENGLISH. A book for those interested in photographing animals, etc. 132 pp., fully illustrated. \$2.50.

ELEMENTARY PHOTOGRAPHY. By ERNEST MARRIAGE. The most useful book on this subject. 148 pp. 26 plates. \$1.75.

PRACTICAL NOTES ON TELEPHOTOGRAPHY. By BECK LTD. A pocket-book of practical information. Cloth, 25 cents.

[READY IN JULY.]

THE A B C OF PHOTO-MICROGRAPHY. A practical handbook for beginners, by W. H. WALMSLEY. With plain instructions and many engravings. About 130 pp. Cloth, *net*, \$1.25.

PHOTOGRAPHIC APPARATUS, its making and repairing, by various English writers. Cloth, *net*, \$1.

FINISHING THE NEGATIVE. An encyclopedic treatise on all the processes between development and printing. Edited by GEORGE E. BROWN. 160 pp. Cloth, *net*, \$1.25.

THE LENS. A practical guide to the choice, use and testing of photographic objectives. By GEORGE E. BROWN and THOMAS BOLAS. Profusely illustrated. 130 pp. Cloth, *net*, \$1.25.

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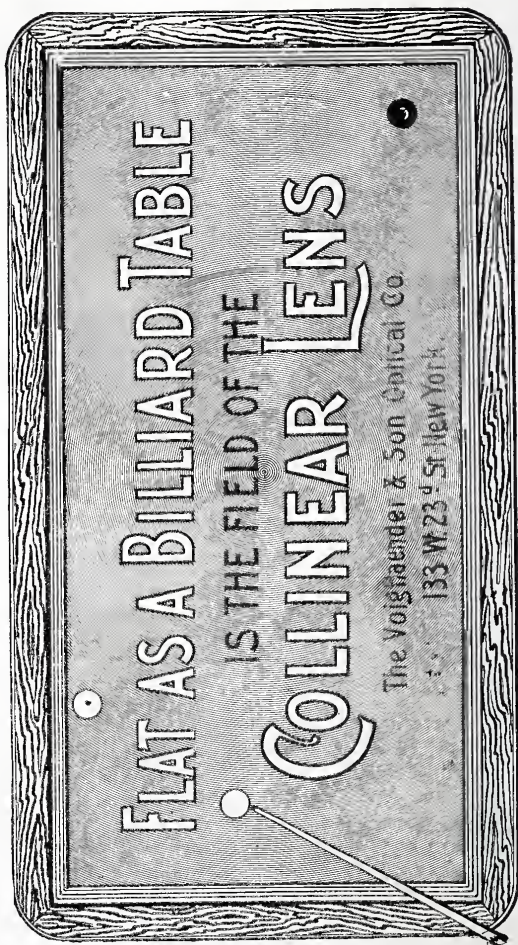
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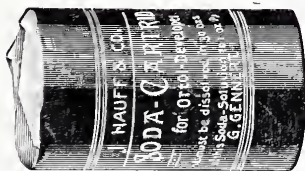
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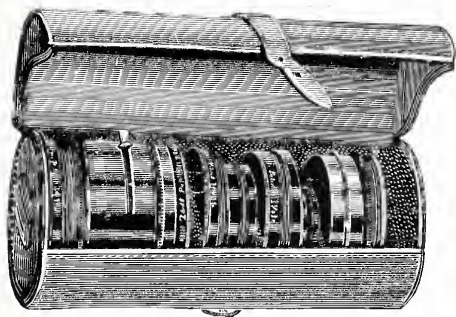
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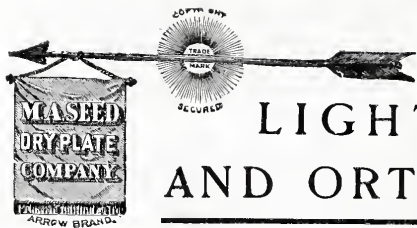
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In making pictures it should be remembered that white light is composed of rays of seven colors—violet, indigo, blue, green, yellow, orange and red. The first three act *much* more vigorously on the photographic plate—even though it be orthochromatic—than the other four. Therefore, if a correct rendering of the comparative brightness of colored objects is desired, some of the actinic or chemically powerful blue rays must be cut off with a filter, which will allow the other rays to pass freely. By absorbing a portion of the blue rays, the filter compensates for the unequal chemical action of light, and the resulting effect is perfect color rendering when the filter is accurately adjusted to the plate. The absorption of part of the light by the filter necessarily increases the exposure. This necessary increase is least with our new filters

The Chromatic Compensator and the Chromatic Curve Corrector

which are especially adapted to our

Landscape Ortho Plate

Note the change in names of filters since our announcement in these pages last month

THE CHROMATIC COMPENSATOR

is light yellow. Used with the L Ortho Plate, it increases the exposure about four times. The values are approximately correct for the yellows, greens and blues. This is a decided advantage in picture-making. It should be used wherever color values are desired and short exposures are a necessity,—as in photographing flowers, seascapes with clouds, landscapes, etc.

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which gives absolutely true values for all colors, including orange and red. This filter is of an orange color. Used with our L Ortho Plate, it increases the exposure about fifteen times. With this filter and our ortho plate you can photograph any colored object in nature or art with absolute fidelity.

For Color Photography, as described in this number of The Photo-Miniature, these new filters, when used with our L Ortho Plates, offer simplicity of manipulation and

Certainty of Results

Be sure that the filter snugly fits the lens tube and is square with the surface of the lens. When not in use the filter should not be unnecessarily exposed to light.

SEED'S ORTHO PLATES and SEED'S LIGHT FILTERS

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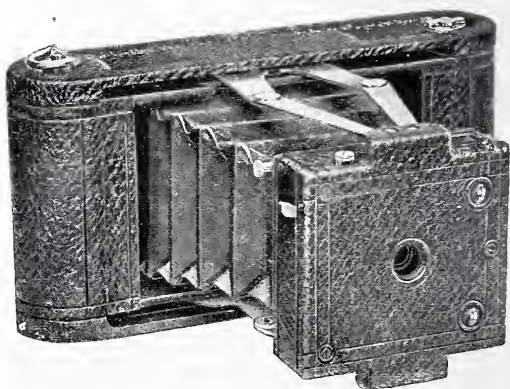
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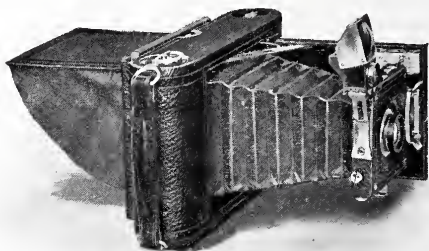
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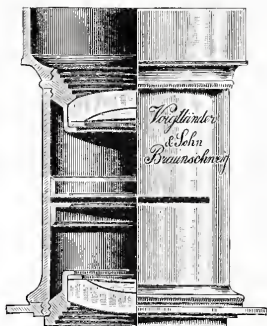
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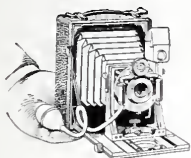
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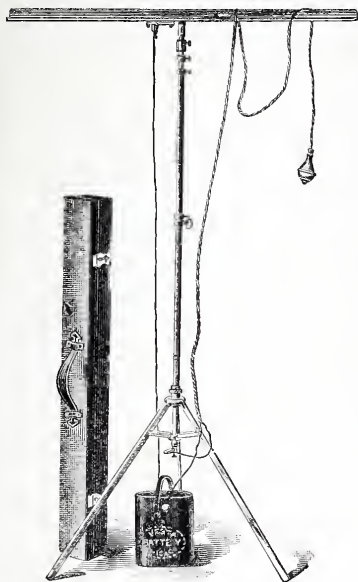
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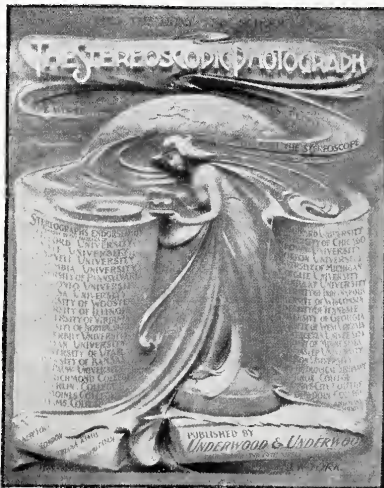
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PHOTOGRAPHING ANIMALS



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Number 39

PHOTOGRAPHING ANIMALS

Any one who will pick up a book of a quarter century ago in which are pictures of animal life, and will compare the figures he sees there with the photographs found in the magazines and nature-books of the day, will at once recognize the important contribution made by photography to natural history. The camera, in the last half-dozen years particularly, has made real to us animal life the world over, and has aided tremendously in the nature-movement now assuming so much force and importance.

Every natural object is within range of the ubiquitous black box, and THE PHOTO-MINIATURE has already recognized the special importance of nature photography. No. 13, "Photographing Flowers and Trees," treats of one branch, and the present little book is intended to treat briefly, and it is hoped succinctly, of the photographing of animals.

Professor Bailey, in a recent editorial in *Country Life in America*, referred to nature- or animal-photography as "the new hunting," in sharp distinction to that pursuit of wild things afield which is only gratified in the death of the subject. Surely this new hunting, quite as exciting and dangerous under some conditions, requiring even more patience and skill, more intimate knowledge and study, has everything to commend it as compared with the hunting that kills!

Even so great a lover of the sport of hunting as Theodore Roosevelt wrote, in the introduction to Mr. A. G. Wallihan's "Camera Shots at Big Game," thus: "But the shot is, after all, only a small part of the free

life of the wilderness. The chief attractions lie in the physical hardihood for which the life calls, the sense of limitless freedom which it brings, and the remoteness and wild charm and beauty of primitive nature. All of this we get exactly as much in hunting with the camera as in hunting with the rifle; and of the two, the former is the kind of sport which calls for the higher degree of skill, patience, resolution and knowledge of the life-history of the animal sought."

Hunting Without Killing In our hunting with the camera the continued life of the subject, happily no longer a victim, is essential, for photographs of stuffed birds, museum specimens of the carnivorous animals or the denizens of the water are only sneered at. Nowadays the successful worker must picture the wildcat leaping toward its prey, the fish as it swims in the water, the mother bird contentedly sitting on its nest or feeding its hungry brood, even the stag at bay or the rattlesnake ready to strike. Far more bravery is required to await the critical moment of the leap of the angry mountain lion with hand on camera bulb rather than finger on rifle trigger; and he whose nerve and endurance are equal to the tireless and patient stalking required for the photographing of even the more humble denizen of the forest may well lay claim to being a true hunter as well as a modern one.

The Game We Bag Instead of trophies of pelt and brush, the nature-photographer brings home his carefully guarded plates, from which he may—sometimes only!—successfully develop the vividly life-like counterfeit presentment of the animal in its native haunts. He has had the excitement and stimulating hardship of the chase; his victories are usually bloodless, while often of unique value to science.

Pictures of Domestic Animals But it is not only the animal creation in the wild that is the subject of the new hunting. All of us cannot go to the untrodden forests or to the haunts of the seals in northern seas. For us there is always in reach a scarcely less attractive, even though a far less dangerous study,—that of the domesticated animals and the household pets, as well as the birds and butterflies

about home. Even this work has its spice of danger. I know there were plenty of thrills chasing themselves up and down my back while I tried to follow up and photograph a great pedigreed bull, who shook off his two attendants as if they were flies when I put the black focusing cloth over my head.

**The Truth
Served**

It was the pioneer Muybridge who, years ago, first showed artists that from the very beginning they had mistaken the action of the horse's legs in trotting, when he photographed the noble animal in full motion. Since then, and especially in the last few years, a vast addition to human knowledge of our domestic animals may be set down to the credit of the camera. The field is as yet barely opened, and a broad and delightful vista of interesting research is before any thoughtful and observant worker with the camera.

**Knowledge
Necessary**

The animal-photographer must obviously be in touch with his subject sympathetically. He must be a naturalist, in the practical, if not in the scientific, sense. Without knowledge of his subjects, he is always at a loss—he is hunting in the dark, with as much chance for bagging game as would come to the old-fashioned hunter who would go into the forest in the dark and blaze away with eyes shut and without aim. Some preparation is therefore necessary in the way of study before one even considers the apparatus and essentials for photographing animals. Is it birds that we are after? We must know what birds are most likely to be found in a certain location, what their nests are like, something of their habits. We need to recognize their songs or calls. We are better able to use the camera if it has been preceded with the field-glass and much observation and study. So it is with any branch of the work, and, indeed, with any work in the world—good results seldom or never follow random methods.

**Patience and
Expertness**

Patience, too, the photographer of animals needs to an abnormal extent. He must be willing to sit motionless for hours, only to be disappointed, perhaps, until repeated efforts bring success. He must add to his knowledge

and patience the best judgment, and to these perfect technique. Let me emphasize the statement that the photography of animals is not for the beginner or for the careless worker. The camerist who would succeed in picturing animals must be free from that uncertainty which accompanies inexperience in the use of his apparatus. The landscape will wait, and one can go to it time and again to correct errors of composition or of exposure; but the animal model one finds, often after long travel and waiting, is not so complaisant—there is often but the one chance, and that most uncertain and fleeting. Proficiency in handling the apparatus for animal-photography, therefore, is essential to success. The worker must use his tools unconsciously, as it were, as one writes with a favorite pen, merely glancing at it, but with mind fully concentrated on the subject. There is no time to think whether or not the diaphragm has been set, or the slide turned in the plate-holder, when after vigorous search and patient waiting the critical moment arrives. A carefully arranged habit of doing the necessary things in a certain proper and almost automatic order, so that the gun is always loaded and ready for game, means the greater chance for success in this difficult work.

But what apparatus is required for nature-photography? In the first place, if the aspiring worker will go afield for his models, extreme compactness and portability are indicated, after which, or even with which may be mentioned strength and freedom from complication. Any attachments or movements of a camera which cannot be used with the eyes shut, or which are in the least noisy or uncertain, have no place in the outfit for the new hunting. The camera, too, must not merely be strong enough to carry its lens and plate-holder; it should have a very large "factor of safety," as the mechanical engineer puts it when he calculates for a great bridge or a high building. Some time the camera may tumble from a tree, or merely upset from the tripod; it should be so solid and secure that it will stand such an accident and still do its work. This means a little more weight to carry to be sure, but, I

say, for animal-photography beware of the "feather-weight" outfit—one which the touch of a feather will upset, and the fall of a bird's egg smash!

The size of the outfit is a matter to be decided by strength of arm to carry, and to a certain extent by depth of purse, though good apparatus is now so relatively inexpensive, all but the fastest lenses, that this latter factor is hardly of great weight. For serious work the small "fixed-focus" cameras making negatives up to $3\frac{1}{2}$ inches square are not to be considered, because, as one successful animal-photographer puts it, "the size of the resultant image would have been too small for value." The quarter-plate, $3\frac{1}{4} \times 4\frac{1}{4}$, may be useful, and good negatives can be enlarged; but few workers who hunt with enthusiasm use less than 4×5 plates. Many, indeed, work 5×7 cameras, and for near-by operations, in the barn-yard or at the "zoo," this and even larger boxes are most desirable. Mr. A. G. Wallihan, whose wonderful photographs of deer, elk, mountain sheep and cougars in their native haunts have attracted much attention, seems to have used 5×7 and even 8×10 , undergoing great hardships, of course. The favorite size of most of the workers of experience, however, seems to be 4×5 , and the various desirable boxes made for focusing right up to the moment of exposure, as the Reflex, Graflex, etc., are all 4×5 . It is essential that the camera be of the "long-focus" type.

The question of lenses is determined, in this case, by the imperative need of the work for unusual speed. Almost any lens will do good landscape work, for "stopping down," thus of course prolonging the exposure, will cure some ills; but when one watches for a moment the quick motions of most animals, it will be admitted that time exposures are out of the question. Notice the motion of a hen's head; see how rapid is the hop of the robin; watch the quick decisiveness of the squirrel as he operates on a nut; realize by their astonishing absence on a trial-plate that a horse can and does move his head and his legs, even when not rapidly trotting or going, faster than the photographic impres-

sion that is made in a fiftieth of a second—and the need of a really rapid lens is obvious. The modern lenses working at speeds greater than $f/8$ are, therefore, indicated for successful animal-photography.

But the fact must not be lost sight of that with the increase in speed comes a decrease in depth of focus, in practically exact proportion. That is why the best pictures of nesting birds, horses in motion, etc., show such an unpleasant mass of "diffusion spots" in the background; and it points the necessity for accurate focusing, especially when there is an attempt to photograph anywhere near to life-size.

Speed, then, is most desirable in a "Convertible" lens for animal-photography. Any of the modern high-grade anastigmatic lenses will do good service in this work, and some of them, more or less on the "convertible" plan, will add another facility—that of varying foci in the separate members of the combination, so that in one lens as purchased there may be three foci, giving three sizes of image from the same spot. In this pursuit of animal-photography it will very often happen that the subject shows too small on the ground-glass, and yet cannot be approached more closely.

If, for instance, the outfit for a 4 x 5 camera includes a good lens of say six inches equivalent focus, and this lens is made up of two separable elements or single lenses, one of 10 inches focus and the other of 14 inches focus, a very great additional power is in the hands of the aspiring worker. He finds, for instance, that the bird's nest he is preparing for, in anticipation of a visit from the occupant, shows a tiny spot only on his ground-glass. If now he will screw out one lens, leaving, we will say, the 14-inch element in the shutter, he can rack out the bellows and obtain an image more than twice the size of that given him by the doublet, and approximating somewhat closely to the image made upon his own retina or "ground-glass" by the human eye. (I have found it desirable to have in my lens outfit always one lens approximating closely to the eye focus,—about 16 inches,—so that I may make the camera see things as I see them, on occasion.)

"Single" Lenses The single elements of many of the better lenses are not in themselves rectilinear, but as there is seldom need to include the lines of buildings in animal photography, this objection is of little importance. More to be considered is the further fact that the single lenses (really never "single" any more, as each is made up of two to four separate pieces of glass) are not as fast as the doublet—that is, they work at a smaller aperture, and must have correspondingly increased exposures. About half the speed of the doublet is usually possessed by each of its separate elements. It is very desirable, indeed necessary for intelligent use, that the proper diaphragm values for each of the three foci in a "convertible" system shall be distinctly engraved on the face of the shutter where the iris diaphragm pointer travels, so that the exposure may be correctly calculated.

Telephoto Lenses Sometimes the longest focus lens in the combination will not give a satisfactorily large image, in which case resource is had by some workers to the very efficient telephoto lenses that magnify the image to various degrees. As this magnification is attended with great reduction in speed, these lenses are only available in animal photography where time exposures can be made.

The Shutter The shutter—and a good shutter is a prime necessity for this work with live animals—should be simple and certain in its operation. All the modern shutters have the three movements—time, bulb and instantaneous—of which the last two are of special importance. The skilled worker in any branch of the art of sun-painting finds much comfort in a quick and sensitive "bulb" exposure, with which, on due practice, he may give under perfect control exposures of even less than a quarter second. The instantaneous exposures, however, are of decided importance, and the shutter selected should have one speed of an *honest* hundredth of a second, if animals in motion are ever to be "shot." Too many of the shutters of the day are "bluffs" in respect to the fast speeds, and the markings of one-fifth, one-fiftieth and so on, all give practically the

same exposure, much slower than is thought. The new Volute shutter is claimed to be reliable up to $\frac{1}{150}$ of a second for the smaller size, and the curtain shutters give reliable speeds up to about $\frac{1}{90}$ second. The focal-plane shutter, such as the new Thornton-Pickard, gives accurately graded exposures from $\frac{1}{20}$, $\frac{1}{40}$, etc., even up to $\frac{1}{1000}$ of a second. Any shutter selected should operate with little or no noise or "click"—and herein lies one of the special differences in animal-photography, in which perfect silence is desirable. The reassuring *opening* snap of the shutter-spring which tells the "landscaper" that he is exposing his plate, may frighten away or startle out of naturalness a shy bird. An extra length of rubber tubing is a very desirable adjunct; even fifty or seventy-five feet of it, to use which successfully a specially large bulb is required.

Not only must the camera itself be absolutely light-tight for this work, and the lens and shutter beyond the suspicion of admitting the faintest trace of unauthorized light to the surface of the sensitive plate, which must, obviously, be exposed *in* the camera, ready for the picture, abnormally long periods while the convenience of the animal subject is awaited; but the plate-holders as well must stand the bright light safely. A cloth bag, with a compartment for each holder—say three in a bag—will be a convenience and a safeguard, but one must have assured faith in the holders also. With it all, the photographer will undoubtedly cover the camera if he can while exercising his patience in a tree-top.

The tripod selected should be strong and well fitted primarily, and of light weight secondarily. It should be so arranged as to properly support the camera even when tipped forward at an extreme angle, and there is a modern device which permits the attachment of the camera in a vertical position, pointing downward, to its head. The worker who will climb trees for bird pictures will often have occasion to use as his tripod a special "ball-and-socket clamp," a simple device which screws into the tripod plate of the camera, and may also be secured about a convenient limb.

**Vertical
Exposures**

For certain work with butterflies and other insects, a form of camera-stand that will permit the placing of the subject on a piece of plate-glass maintained on a horizontal plane, with the camera secured vertically above it, is useful. There are many such devices; one is illustrated in PHOTO-MINIATURE No. 13, on page 16.

**Focusing
Cloth**

A focusing cloth of satisfactory dimensions and unobtrusive character may be made, say 3 x 3 feet, or a yard square, from a good quality of light-weight, closely woven woolen dress goods. It should be dark green or olive in color; for to have it of a color which will blend with the tree foliage is almost a necessity—in bird-photography especially. Such a cloth will be much more comfortable to use than the smelly rubber affairs, and it will turn water for quite a while, on occasion. It is also very serviceable for wrapping up the camera in the event of a shower.

**“Protective
Coloring”**

While the subject of unobtrusive accessories is up, let me suggest the usefulness of imitating nature in “protective coloring.” Shiny nickel-plate and varnished brass are all very pretty in the camera store, but anything but desirable in the field. I have had my shutter and lens fronts carefully blackened, and one camera has the mahogany polish also covered with a matt black coating, to avoid reflections. The result is not displeasing in appearance, but the contrary; and, I am glad to notice, in the finish of one of the high-grade cameras of this year of 1902, a departure from glaring polish, which is certainly a detriment in more than one branch of photographic work.

The brothers Kearton, who were among the pioneers in photographing birds, have used a variety of hollow, portable tree-trunk blinds, etc., as adjuncts in their work, and with great success. The American practice, however, seems to avoid any “dunnage” that can possibly be dispensed with, and it is but seldom that one hears of Chapman, Dugmore, Hewitt, Brownell, Job or other successful workers availing themselves of

any other aids than those that could be supplied on the spot, with the use of native ingenuity.

Twin-Lens Camera

In field work, with the quicker-moving animals, the uncertainty of using the marked focusing scale on the usual camera front and the difficulty, not to say impossibility, of focusing, closing and setting the shutter, inserting the plate-holder, withdrawing the slide and making the exposure before the bird, bug, fish or fowl has passed out of range, has had a stimulating effect upon the ingenuity of the naturalist-photographer. The twin-lens camera was the first to be so arranged as to permit focusing with the plate in place and the shutter set, so that when the image was satisfactorily reflected on a shaded, horizontally placed ground-glass the exposure could be instantly made. A duplicate lens, of the same focal length as that which actually takes the picture, is used, and the device is entirely successful, the objections to it being its double bulk and weight and its much higher cost. With it may be used any shutter, and it is not absolutely necessary to have the focusing lens of the same quality as the working lens. Barring the bulk, weight and cost, the twin-lens camera is one of the best devices for accomplishing the object in view.

Reflex Camera

The Reflex camera is a very ingenious piece of apparatus, which, by means of a mirror, set at an angle behind the lens, reflects the full-sized image upon a ground-glass placed at right angles to the plane of the plate, near the top of the camera, where it may be readily viewed under a shield or hood. The focal-plane shutter is used, placed just in front of the plate. When the critical moment is reached, pressure on a button releases a spring which throws the mirror aside and simultaneously causes the shutter to operate, exposing the plate. The operation of the shutter is attended with a somewhat objectionable noise, but the great convenience of the apparatus has made it quite popular. With it, the naturalist may "stalk" or follow up his subject, holding the camera in his hands, and focusing as he observes the animal to be pictured, exposing instantly when everything is "just right."

A new camera, known as the Graflex, has been placed on the market this season of 1902. It is arranged with very convenient eye-shields, and reflects the image full size upon a ground-glass screen. The camera has a reversible back and rising front, and the bellows give 15 inches focal capacity in the 4 x 5 size. The shutter is an improved form of the focal-plane type, giving a variation in speed between one-fifth and one-thousandth of a second.

A Pocket Camera The experienced worker often carries with him one of the extremely convenient pocket cameras—the Folding Pocket Kodak, for instance—with which to take instant advantage of opportunities not available for the larger box. These complete little instruments serve a most useful purpose in the hands of skilful users, who will know when and how to take advantage of their readiness. With proper care and practice in holding the camera steady during the quick exposure, very sharp negatives may be had, that can readily be enlarged to practical usefulness.

General Observations Before taking up the photography of animals in specific classes it is well to note some things that will serve in all cases. How shall we picture the animals? What attitude shall be preserved, if possible? In what surroundings and conditions? I have spoken earnestly of the necessity of knowledge of the subjects of this fascinating work, but there needs to be more than knowledge, or knowledge needs to be made available through careful and special observation and preparation. Animals, most of them, do not “pose” in the human and conscious sense, but their positions, in the life round, are many and various. Upon this subject I quote from a paper read before the Royal Photographic Society of Great Britain, by Mr. Douglas English:

Characteristic Attitudes “To return to the consideration of character, movements or attitudes characteristic of different animals have become so familiar in many cases as to have passed into proverbs. To ‘creep like a mouse,’ to ‘stare like an

owl,' to 'grin like a dog,' are a few of the expressions which immediately occur to one, and the list is of much greater length than might be supposed. A slight consideration will suffice to show that such expressions are originally the result of close observation. Most animals, including man, adopt certain definite postures and expressions more frequently than others. These, from constant repetition, gradually come to be regarded as characteristic. . . . In all animals at least two characteristic positions may be looked for—the position of action, and the position of repose. Both admit of subdivisions: action, for example, may comprise defence and attack. The attitude of the cat stalking, and that of the cat with arched back, are equally characteristic of the cat in action, the 'curled' attitude and the 'stretched' attitude, equally characteristic of repose."

The Plates to Use So much for the apparatus. The plates to be used in animal-photography must obviously be very rapid, and the worker who fills his holders with any other than one of the brands in the first ranks as to speed, is adding a handicap to an already difficult pursuit. Inasmuch as many of the animals sought to be photographed in their native haunts are surrounded by the various greens of foliage or grass, a plate that gives reasonably correct color-values is indicated. Personally, I should always prefer to use for everything the best and quickest obtainable orthochromatic or isochromatic plates. While I know that much good work is done on ordinary or "plain" plates, the latter always fail one at some time, when the lack of proper color-correction becomes painfully apparent.

A plate corrected, as are most of the modern orthochromatic or isochromatic plates, to give a better rendering to the yellows of nature, also helps along the greens of the foliage, and at the same time slightly improves the situation with regard to the blue rays of the spectrum. Thus a corrected plate used on a blue sky with white fleecy clouds, while failing to show these clouds in great distinctness, will still indicate their presence sufficiently to avoid the unpleasant blank white sky that

the uncorrected plate always gives under these conditions. In the same way the blue markings of a bird are rendered approximately even without a ray-filter. Theoretically, the ray-filter should be used on highly colored birds, butterflies, etc., but practically, the opportunities to use it in connection with animal life are exceedingly rare, and it may well be set down as a dictum, therefore, that the worker must depend for his color-values on the best color-rendering fast plate he can get, and not on the adventitious aid of any device whatever that in any respect reduces speed.

It is also a great advantage to have the plates one is to use in work of this kind, especially where attempts are to be made to photograph the smaller animals in anything like life-size, "backed" to avoid halation. This may seem like foolish advice, but anyone who has ever experimented with both backed and unbacked plates on a subject of light colors, will agree with me that the vast increase in available detail obtained by the use of the plate upon which interior reflection and spreading of the light has been prevented by some properly absorbent medium, much more than fully repays one for the work of extending the usefulness of plates in this way. There are many good backing mediums in the market, all of which accomplish the object aimed at, more or less successfully. Some are cleanly in use and some "smeary." Some are not easily removed before development, as is necessary in order that one may inspect the progress of the light action, but the backing I have long used on literally thousands of plates goes on easily, stays on safely, and comes off with neatness and despatch when its presence is no longer serviceable. It can be made up very readily, and is simply a soap solution as a carrying medium, in which are dissolved two dyes that have the property of absorbing the light that penetrates the plate. This dyed soap solution has likewise almost exactly the same refractive index as glass, and there is, therefore, practically no additional reflecting surface presented in its use. To prepare this backing take, say, eight or ten ounces of ordinary grain alcohol, and say an ounce of powdered Castile soap. Shake these to-

gether in a wide-mouthed, closely stoppered bottle at intervals for several days, until the alcohol has taken up all of the soap it can carry. This then forms a stock backing solution, and as it is taken off for the work of backing plates, fresh alcohol may simply be poured into the bottle until the soap has all been dissolved. Of this clear soap solution pour off 2 ounces, to which add 10 grains of aurin and 10 grains of erythrosin, two cheap and easily obtained aniline pigments.

To use this dyed soap solution smear it with a brush or a wad of cotton on the backs of the plates it is desired to protect, using of course for that purpose a very dim red light. If the plates are taken in pairs, face to face, as they come out of the plate-boxes, smeared on each side with considerable care to avoid getting any of the solution over the edges, and so onto the sensitive emulsion, they may be stood up to dry in a warm dark-room, and the first pair taken out of the box will be dry by the time that the last pair of the dozen is coated. They may then be replaced in the plate-boxes or placed in holders. The alcohol having evaporated, there is practically no moisture present, and the plates will not deteriorate or attract moisture, nor will they stick to anything.

Before development, the backing may be readily removed with a wad of wet cotton rubbed lightly over it without wetting the face of the plate at all, and in practice I am very careful to keep the face of the plate away from the light while it is being done. It is by no means essential to remove every trace of the backing, for a little of it remaining will only so color the developer as to make it practically an additional ruby glass and thus fully protect the plate during development. I have occasionally forgotten to remove the backing at all, with the result of having the emulsion stained a pink color until careful washing had removed it. The only disadvantage of this backing is that in the red light of the dark-room it is almost invisible and colorless, and so practice and judgment are required to know whether it has been fully applied as well as to guard against smearing any of it on the face of the plate.

**Domestic
Animals**

Having given due consideration to general principles and to apparatus, we may well begin the specific discussion of our subject by taking up the photographing of domestic animals. Of the thousands who will read this monograph, very few will have opportunity for long journeys after the rarer wild animals, and not many can engage in the work with enough time, patience and accessories to make acceptable pictures of fish. Everyone, however, has chances, and constantly recurring chances, to study and to photograph the domestic animals of our civilization. Dogs, cats, chickens, horses, cows, sheep, swine—some of these are within reach always, for most of us. While the zest of the hunt, the spice of danger, the long tramps afield, are missing in this work, it has its own difficulties, and its rewards are entirely adequate. The writer has a connection with an advanced and elaborately illustrated magazine dealing with country life, and he has been made very sensible, in the past year, of the great scarcity of good photographs of the familiar animals about us. An endeavor to supply certain pictures has fully brought out the difficulties to be encountered, as well as the attractions of the quest. Let us, then, in nowise despise the household pets, the street dogs, the cattle of the field, as objects of interest for our cameras, and, indeed, of profit for our pockets, if success is attained.

Cats

The "tabby" of the home is the easiest of the subjects, apparently. Endless are the ways in which cats are pictorial; endless are the contrarieties of the felines! Choose that way and place and attitude which most attract you, and try your camera on the puss. She is calm, peaceful, but by no means immobile, you will find. Scan closely the lighting—you must, almost, be showing the house cat *in* the house—and make your trials. Make them at home, if you can; for strange cats, like strange babies, are not favorable to strangers at all times.

The bait of food is often suggested for luring these animals, and for securing attention, but I deprecate its use, unless the scene is plainly a feeding scene. A

hungry look is not the most attractive aspect, and it is to be your art to show the sitter in a comfortable or an alert or even excited condition. Familiarity and petting will often do better than food, especially if the photographer has that sympathy with animals which they so promptly recognize, and without which he is at a very great disadvantage in the handling of our domestic pets and helpers.

Delightful work can be done with
Lighting kittens, given the art of handling them.

Where several are photographed at once, a very quick light becomes essential. Outdoors on an overcast day, or in places protected from the direct rays of the sun, this work can be done to advantage. Again, take care of the lighting; the most pictorial and satisfactory effects are not had when the camera light is full on the front of the subject. Before me at the moment are three fine pictures of a beautiful white Persian cat, "Zoroaster," by Alfred Klakring, all lighted at an angle to the camera, and so as to bring into relief by shadows the whiteness of the cat's long hair. In focusing for such a picture, look for shadows in the white parts. If you do not have them, the result will hardly be pleasing.

The familiar pets of the home, the
Dogs useful helpers of the barnyard and pasture, are anything but easy to photograph. Their very charm of vivacity and alertness is the difficulty. Well do I remember a session had with a splendid and most friendly Scotch collie, who would look at me with rapt attention while my head was under the focusing cloth, only to bound high in the air out of sheer playfulness, when I emerged, all ready to snap the shutter! Many plates were spoiled before we fully agreed. But dogs do acknowledge authority, and will sometime "stay put." If the alert and active life is to be shown, we must work outdoors, and with quick shutter. The sleeping dog may serve for the slower indoor exposure; and this points the fact that in all this work, whether it be dog or grizzly bear, a *series* of pictures of the same subject is most desirable if it can be had, showing the animals in various attitudes.



WESTERN RED-TAILED HAWK
W. E. Carlin



GRIZZLY BEAR
An example of photographing in parks
L. W. Brownell

As some dogs are of large size, it is well to caution the naturalist-photographer as to the focal length of his lens and the position of the animal. With an ordinary lens of say 6 to 8 inches focus, an astonishing distortion shows if the big dog is posed with head away from the camera. A full or nearly full side-view, or a view with the head toward the camera, will be best. If several dogs are grouped, consider this matter all the more carefully, to avoid a grotesque result.

Quick Exposures With the most rapid plates and a focal-plane shutter, we may succeed in catching the dog's picture as he runs at full speed — and thereby will we acquire some astonishing knowledge as to what queer positions four feet can assume! And the point will be emphasized that instantaneous pictures of an animal in motion do not *show* motion, at all.

Of the domestic fowls very charming pictures can be made, especially when the soft, fluffy little balls of down that include very young chickens, ducks and geese are considered. The swimming animals give a particularly fine opportunity, for the reflection of light from the water affords so strong an illumination as to help greatly. Chicks feeding are good subjects for pictures, practice and patience, and a little child in the composition adds much to its charm, if properly placed.

Horses Very few good photographic pictures of horses are extant, comparatively. It is not because this noble beast, the friend of man, has not attracted the ubiquitous camerist, but because he has baffled, to a great extent, the efforts to picture him. There are, of course, vast numbers of mere photographs of halter-led animals, but these are not much better, from the pictorial standpoint, than photographs of stuffed museum specimens of birds and the like. Yet such work, to show the "points" of the horse, must be done, I suppose, and it will not be amiss to quote the suggestions of an experienced and somewhat artful professional worker, as recently presented in the *New York Tribune* :

"The best results are obtained by placing the horse on a slight incline, so that the fore feet are a trifle higher than the hind feet. This position throws the head up. Then snapping the fingers or making any slight noise will cause the animal to prick up his ears, and at the moment when he is in this position of attention the photographer makes the picture.

"When horses in harness are to be photographed they must be posed on level ground or on a very slight incline. To make them look alive a hat or a card is sometimes tossed up in front of them, and at the moment when they look up the snap-shot is made.

"When pictures of horses in action are made we usually place the camera near the ground, and by that means we get the best hoof positions, which cannot be secured when the camera is held or placed at the ordinary height. To make pictures of jumping horses, the same method is employed, and the height of the jump is sometimes exaggerated by placing the camera below the track-level. An excavation is made in the ground for that purpose, and pictures made from there increase the apparent height of hurdles and make a small jump look something remarkable."

The Horse in Action The horse in real action is another matter, and we must go after him just as we would any other interesting animal. If he is to be pictured at work, select the point of view past which the horse will come, being most careful that the camera is so placed as to see the animal either broadside or somewhat "head on." Ignorance or neglect of this dictum produces some remarkable results: I am minded of my own attempt some years ago to make a photograph of a horse's head from the carriage he was pulling, with a "fixed-focus" camera. The film, on development, showed in the distance a a diminutive head, but the hind quarters of the horse, occupying very fully the foreground of the photograph, were anything but diminutive!

To secure pictures of a horse in active motion a very quick exposure must be made, and as the human eye cannot follow the complex movements of a horse's feet when trotting, the result, even when successful technic-

ally, may be anything but pleasing. A recent successful coaching picture in *Country Life in America* — a periodical that gives to animal photographs the best possible reproduction and setting — was made just as the horses started, and before they were fully at work.

Horses at Work Fine pictures may be made — if the worker is able to compose them! — with real working horses as subjects. What is a better exemplification of power than the strain of a good team pulling a loaded wagon up a stiff incline! How the great shoulders reach forward, and the strong legs set themselves surely on the roadway! Or a team plowing — here is a fine pictorial subject, for it shows both horses and man in action, and therefore lifelike, and the speed is not so great as to make good work improbable.

I cannot resist the temptation to express a hope that in the photographing of horses, pictures may occasionally be made of "bob-tailed" horses, deprived by silly fashion of their most useful and ornamental caudal appendage; for their photographs are always disgustingly grotesque, and serve well as tracts against this cruel and foolish practice.

Quick Motion Let not the aspiring maker of horse photographs feel any surprise if some of the negatives from which he has hoped much show an entire absence of one leg, the entire tail, or even the head. Be not alarmed: you are only experiencing a demonstration of the fact that a horse's motions in chasing a fly are somewhat quicker than the leaves of the average camera-shutter.

Horses at Liberty To get pictures of the horse in his most natural and graceful attitudes, one must find him at liberty in a field. Here even the most sober cart-horse shows his joy at the freedom that has long been denied him. Patience and a quick shutter will tend toward fine results in photographs of the many free and unconstrained positions constantly recurring under these conditions. A good hand-camera, or the twin-lens or Reflex boxes, will also help to get good things without an undue use of patience and plates.

Cattle Cows, oxen and other horned domestic cattle have been freely photographed, and some fine examples of their value in pictorial composition are extant. Nothing tends more to the expression of peace in a landscape than the presence of quietly feeding cattle; nothing expresses better the dignity of animal labor than the sturdy ox-team passing with a heavy load. In the language of the day, these subjects are "easy," yet a word or two of caution and suggestion may not be amiss.

The color-value of a handsome cow needs to be considered very carefully in relation to the proposed background or setting, for frequently the beautiful soft dun shades that show to such advantage against the green floor of the pasture are sadly disappointing on the negative. Sometimes when this difficulty is fully realized, and the worker cannot supply either other cows or a different background, he may yet wrest success from difficult conditions by a proper use of the light. If the camera is pointed toward or nearly toward the sun, the contrasts will be heightened and a line of light may be secured along the backs of the cows that immensely helps the pictorial effect. It must not be forgotten, however, that this implies longer exposure to obtain a proper rendering of the shadows.

The Curiosity of Cows The very tameness of domestic cattle introduces a curious difficulty. I needed once to obtain a picture of a fine herd of Alderney heifers of high grade, upon a great dairy farm. When I took my camera into the rolling pasture, all the young animals ceased feeding, and then came for me on the run, attracted by the new and curious critter with a black cloth and three extra wooden legs. I wildly waved my arms and the focusing cloth, but the heifers refused utterly to scare or to move except as they in turn smelled the five somewhat nervous legs that were interesting them. I concluded, while they were satisfying their curiosity, to try for a head picture of one of them, and after many twistings and turnings, had things apparently right, and squeezed the bulb. On development it appeared that in the brief interval of time taken to insert the plate-holder and withdraw



AMERICAN ROBIN FEEDING YOUNG
L. W. Brownell



LONG-TAILED MOUSE
W. E. Carlin

the slide, another heifer had backed in so that her hind legs depended most extraordinarily from the chin of my real subject!

The herd did not quiet down and resume feeding for more than an hour, and I mention this as an important point for any one first attempting this work—he must be prepared to wait more or less patiently until the animals accept him as part of the landscape, all the while avoiding any abrupt or rapid movements.

The head of a calf, face front, makes **Large Heads** one of the finest domestic animal pictures I have ever seen. Try for such pictures; your skill, patience and plate-supply will all be tested, but the satisfaction in event of a good result, and indeed its commercial value, will well repay you.

While good pictures including horses **Sheep and Swine** are scarce, and those with cattle are none too plenty, the gentle sheep has been somewhat overdone. "Sunset" pictures, with the evening light against the fleeces of the flock, are everywhere, and I would do nothing to add to their number. But of individual pictures of sheep in characteristic surroundings, of "heads" of high-grade lambs and ewes, there is no over-supply. The work is much like that suggested for cows, though somewhat less difficult, because of the colors of the subjects. There is a wide opportunity for individual and successful work, and I hope we may see less sunlit sheep's backs and more character studies of these familiar animals.

Swine, I confess, do not seem to me pictorially attractive, and yet Douglas English, in his excellent treatise on photography from the naturalist's standpoint, lauds them as fine subjects for the camera. Little pigs would seem to have possibilities, but until we have arrived at an understanding that the pig is not necessarily a foul and dirty animal I can hardly recommend the average American pig-sty as a satisfactory place in which to operate a camera.

In passing from this portion of the subject, I may say a word as to the value of good photographs of domestic animals. The successful worker can secure a

fair price for his pictures, and the study of this near-by and familiar animal life may be made not only interesting but remunerative. The growing use of nature-pictures in our proximity of illustrated periodicals is a very substantial encouragement to any intelligent and persistent photographer.

Of the forms of wild animal life closely about us, birds afford the best material for the naturalist-photographer.

Photographing Birds Many and various in size, color and form, they are also as various in habits and haunts. To hunt them with the camera is fascinating, arduous, perplexing and satisfying as well, and in the art of bird-photography—for it is surely an art—there is enough to learn to make it an absorbing pursuit. Of its charm let one speak eloquently who is at the head. I quote from Mr. Frank M. Chapman's "Bird Studies with a Camera":

"As a one-time sportsman who yielded to none in his enjoyment of the chase, I can affirm that there is a fascination about the hunting of wild animals with a camera as far ahead of the pleasure to be derived from their pursuit with shotgun or rifle as the sport found in shooting quail is beyond that of breaking clay 'pigeons.' Continuing the comparison from a sportsman's standpoint, hunting with a camera is the highest development of man's inherent love of the chase. The killing of a bird with a gun seems little short of murder after one has attempted to capture its image with a lens. . . . What mental vision of falling birds can be as potent as the actual picture of living birds in their homes?"

Bird-photography needs certain additions to the appliances already described as common to the photographing of animals in general. The twin-lens or the Reflex camera will be serviceable, the dark green focusing cloth, the ball-and-socket camera-clamp, the extra length of tubing to actuate the shutter from a distance (a strong thread is sometimes substituted)—all these will come in play. In addition it is desirable to have a very short tripod, ranging from 6 to 18 inches, for working very close to the ground. A pair of climbing-irons—such

as telegraph linemen use—will help up a smooth tree, and a stout cord will be needed to draw the camera up after the climber. A good mirror, about 10 x 12 inches in size, is of great service in reflecting light into dark places. Mr. Chapman suggests that it be framed simply in white pine, so that it may conveniently be clamped or fastened in a proper position. A pocket mirror will also be serviceable, enabling the worker to read the shutter and diaphragm markings from the rear. A really good "finder" for the camera is a decided advantage—one giving a brilliant image of about the same proportionate size as the camera's lens. For photographing the nests of birds living on the faces of cliffs the brothers Kearton provide an elaborate and special outfit of ropes; but I assume that few of my readers will be ambitious in this direction.

It is almost certain that the beginner Birds' Nests in bird-photography will want to make nest pictures. In so doing he secures valuable information and experience, and he has always the chance of picturing the birds to whom the nest is home, as they return to it.

There are two ways to do this work—one, termed by its exponent in a published treatise,* "A New Method of the Study and Photography of Birds," involving the bringing of the birds and their nests to the vicinity of the camera; and the other implying the finding and the study of the birds in their natural environment. The former has a certain measure of convenience to commend it, but nothing else. It is thus described:

The Nest Moved "The nest, whatever its position, is brought under immediate control by removing it with its supports, that is, by cutting off the twigs, entire branch, or hollow trunk, or by taking up the sod in the case of nests on the ground, and carrying the whole into a favorable position for study. It may be moved fifty feet if necessary, but should not be placed where it cannot be readily seen by the birds. The nesting bough is firmly nailed to stakes which are driven into the ground at a convenient height, and is protected by a screen of wire netting,

*"The Home Life of Wild Birds," by Francis H. Herrick.

three or four feet tall, to keep off prowling cats and the other enemies of the nestling bird. A green tent is then pitched before the nesting bough, and when in operation it is only open at one point, marked by a small window in line with the photographic lens and the nest. Under this perfect screen the operator can stand or sit at his ease, and watch and record with note-book and camera the rapidly shifting scenes of the panorama of nest-life.

"The old site of the nest is soon forgotten by the birds, while the new one is adopted in a surprisingly short time, and as completely as if it were of their own choosing. When possible the nest is not touched or disturbed, but moved only with its supports. Our ability to overcome in this summary fashion the otherwise insuperable difficulties of light and position, by controlling or changing the site of the nest, depends upon certain fundamental laws of instinct and habit. Parental instinct is the key to the whole problem. This potent inbred power binds the old bird to its young by an invisible chain, which increases daily from the time of nest-building until the fledglings are on the wing. To apply the method we have to determine the strength of this instinct at any given time. We should not, as a rule, disturb the nesting site until the young are from seven to nine days old, when the parental instincts are approaching their culmination."

The writer does not tell us what becomes of the bird family thus ruthlessly removed from its natural surroundings, and the whole scheme assumes an attitude of refined cruelty that is not at all in consonance with the merciful intent or the sportsmanlike truth of the "new hunting," in which the naturalist overcomes all the difficulties of location and lighting, managing by his own ingenuity and skill to secure pictures of the nests and the birds without removing or destroying either.

The true method, that used by the successful enthusiasts who have added so greatly to our bird-knowledge as well as to our store of bird-pictures, is to photograph the nests where they belong. It is more difficult, but it is both merciful and true. I am glad to present suggestions as to this method from one whose work is of

the best, and to whom, indeed, much of the subject-matter of this monograph may be credited. Upon nest- and bird-photography, Mr. L. W. Brownell writes:

The Nest "It must be remembered, primarily,
Undisturbed that a picture of a bird's nest to be of
 any value must be taken showing as
much as is possible of its surroundings, and also showing plainly the detail and construction and the manner in which the nest is attached to its support. In order to do this to the best advantage the nest should invariably be photographed *in situ*, and this, as can readily be seen, often presents great difficulties, the overcoming of which affords one of the chief pleasures of the work to any one who is seriously interested in it. The nests built on the ground, or within a few feet of it, present an easy mark, but those that are placed high up among the branches of the trees, and particularly, as frequently happens, when they are at the extremity of some branch, these are the ones that tax the ingenuity of the operator to the utmost limit. . . . Let us begin with a nest in some small bush or shrub two or three feet above the earth—a subject comparatively easy. Make the tripod legs of such a length that the lens of the camera will be from six inches to a foot above the nest, and tilted so as to be pointing diagonally downward toward it. This will allow a view of the inner as well as outer construction of the nest, and the picture will not carry to the mind of the person who sees it an incorrect idea of its situation, as would be the case if the lens was pointed directly down at the nest.

"If the eggs do not show, a small tuft of cotton may be inserted underneath them in order to raise them into view, but care must be taken not to raise them so high as to give an appearance of shallowness to the nest, and also that the cotton does not show. When arranging the nest, disturb as little as possible the surroundings, for half the value of the picture will lie in the fact that it is an exact reproduction from nature. At times it will be found necessary to cut away some of the foliage in order to obtain an unobstructed view. Do this with extreme care that the stubs of the twigs removed may not show. Never tip or otherwise disturb the nest

itself, else you will be apt to make its position unnatural. When you have a sharp focus on the nest and eggs, regardless of the background, the lens should be stopped down until the immediate foreground and the background for a considerable distance are in sharp focus. This will necessitate a long exposure, so that a day upon which there is any wind blowing is an extremely poor one for nest-photography. During the exposure always shade the nest from the direct rays of the sun, as a diffused light will invariably show better detail, especially upon the eggs, which reflect the glare from the sun, sometimes even to such an extent as to cause halation upon the plate.

"With nests placed on the ground the short tripod should be used, as with the high tripod it is impossible to get the camera sufficiently near the level of the nest. The grasses in front should be pressed aside rather than cut off or pulled up, but that is a matter in which the judgment of the operator can best assist him.

"Should the nest be placed so high up in a bush too small to bear a person's weight, as to make it impossible to reach it by the aid of the ordinary tripod, the legs may be lengthened by sticks securely bound to them. Often have I made my tripod nearly ten feet long in this manner and have done the focusing while standing upon the shoulders of an assistant.

Nests in Hollow Trees "The nests of the woodpeckers, wrens and other birds which breed in excavations in the limbs or trunks of trees, must be treated in a wholly different manner. As the nests are often in places impossible to reach with a camera, it will sometimes be found necessary to remove the entire limb and place it in position nearer the ground. This, in my opinion, does not materially alter the surroundings of the nest, but I do not advise doing it except in extreme cases.

"In order to show the eggs and inner construction of the nest, two methods may be followed: Either cut away the wall of bark from the entrance-hole down to the nest, or else, after removing the eggs, ascertain by means of a small stick, the exact depth of the hole, and with a small key-hole saw cut a square hole into the

nest, leaving the remainder of the wall complete. By this latter method one can show both the entrance hole and the eggs in their original place, and I consider it much the better way of the two. After photographing, the piece removed can be returned, leaving the nest intact. In all this work, avoid disturbance of the surroundings as much as possible. By tying back tree limbs, cutting may often be avoided.

"It is often necessary to reflect light into the nests of some of these 'cave-dwellers,' and this can be done by the aid of a small mirror, but care must be taken not to make the reflection too intense.

Nests in High Trees "Photographing the nests of the tree builders is a much more difficult problem. It is then necessary either to lash the tripod to several of the limbs, or else to fasten the camera to some one of them by means of a ball-and-socket clamp. The same general directions hold good here concerning the surroundings of the nests, except that a greater number of the leaves in the foreground will, in all probability, have to be removed in most cases. This is owing to the fact that the slightest breeze will often sway the branch upon which the camera is fastened sufficiently to destroy all sharpness of outline in the picture, to obviate which a quick exposure is necessary. This necessitates a larger stop and, consequently, less depth of focus. Leaves in the background must obviously be out of focus, but it is important that there is nothing between the nest and the lens that is not sharply defined. In fact, the less of anything there is in front of the nest, the better will be the picture.

"In cases where the nest is placed at the extreme end of a branch, it can often be successfully photographed from some adjacent tree, especially if a telephoto lens is used.

"But, after all, when everything possible has been said upon this subject, and unlimited advice been given, the beginner will speedily learn that experience is always the best and surest teacher, although she is severe, and is liable to give her scholars some pretty hard knocks ere she graduates them.

Photographing Young Birds "When one has become somewhat proficient in nest-photography let him turn his attention to the young birds as they come along. This is, to me, one of the most fascinating branches of the work, for a young bird is a most interesting subject from the time it leaves its shell, and the fact that pictures, accurate in details, may be obtained, satisfactorily recording its appearance at the different stages of its growth, makes its study by the photographer of exceeding importance. When it is possible to do so, a series of pictures should be taken showing the rate of growth of the nestlings, their feathers in different stages of perfection or imperfection, the manner in which they are fed, and any other detail which may appear important. To make such a series invaluable, accurate notes of the age of the birds, the date, etc., should be made with each picture. In this manner more valuable data may be obtained concerning the growth of young birds than by any other means.

"Young birds are extremely easy subjects, as they have not yet learned to fear man as they will do when a little older, and they consequently allow themselves to be handled and will 'stay put' when placed upon a limb or branch of a tree. They must be photographed, however, in strong light, as their respirations are so rapid as to cause anything but the quickest exposure to be inadequate. On this account, when the nest is in the shade it is often necessary to have recourse to the reflecting mirror in order to obtain sufficient lighting.

Birds Feeding "In order to successfully photograph the old bird feeding her young, it will often be necessary to screen the camera and work the shutter by means of a long tubing from a distance. There are various appliances that can be used in doing this. I usually build a 'blind' upon the spot and find that it answers all purposes. After having focused upon the nest, attached the long tubing, set the shutter and withdrawn the slide from the plate-holder—in other words, when I am in readiness to make an exposure—I simply build a slight screen in front of my camera by means of some leafy branches. It does not take much to conceal the tripod and camera,



CICADAS

Larva, newly hatched insect and perfect insect

L. W. Brownell



GRASSHOPPER SWINGING ON GRASS HEAD
L. W. Browne!

and a few minutes will always suffice to efface it sufficiently to satisfy the birds. Care must be taken that no twig or leaf project in front of the lens, else the picture will be of no use.

"Some birds are less timid, especially if you have made their acquaintance by repeated visits, and they will feed their young within a few feet of the front of the camera with no apparent trepidation, even when it is denuded of all covering. In cases of old birds brooding upon their nests the telephoto lens can be used to great advantage, but with young birds their movements are so constant that the exposure necessary with this lens to make a perfectly timed negative is not quick enough. The greatest aid in this work is either a Reflex or a twin-lens camera.

"It is sometimes desirable to eliminate some disturbing element from the background. This can be very easily accomplished by hanging a piece of white cloth far enough back of the nest to be out of focus. In this way the birds are often shown to better advantage. When they are old enough to leave the nest, most satisfactory pictures of them can be obtained as they perch upon the branches in characteristic attitudes.

"In photographing flying or soaring **Flying Birds** birds, one of the two cameras just named will be found to be absolutely indispensable, for by no other means can so quick a focus be caught. I should advise, moreover, the use of the Reflex for this work, in preference to the twin-lens, for the focal-plane shutter is capable of the greatest speed.

"In enticing grown birds in the full possession of their powers of maturity within range of the camera-lens, various and numerous devices may be used, and the results obtained will be in accordance with the skill and ingenuity of the operator, although I cannot but admit that luck plays a large part in all nature-photography. The birds may often be brought to the required spot by means of bait. This is most easily done in the winter when there is snow on the ground, for at this time of the year hunger is apt to make most birds less suspicious. One may also bring a number of birds

**Decoying
Models**

within close range by secreting himself and imitating the call of some bird in distress, then with the aid of the Reflex very excellent pictures may be obtained. Also, a stuffed owl, hawk, or even a snake placed in the immediate neighborhood of a bird's nest will almost invariably bring a number of scolding mothers around. Another very excellent way, but one which only works when the birds are building, is to attach some soft material to the branch of a tree in close proximity to the site of a partially completed nest, focusing your camera upon it. If one of the birds does not soon discover it and seek to carry it off, it will be because you have not chosen a proper material."

Photographing Very great difficulty appears in secur-
Water-Birds ing pictures of the strange birds that live on the water much of the time, breeding on inaccessible cliff-sides or in deep marshes, or the like. Yet the enthusiasm of the new hunting has secured, even in these difficult situations, remarkable photographs. The new naturalist dangles, like Cherry Kearton, at the end of a long rope, using every limb and every faculty at once to secure safety and picture the birds in their haunts; or he makes a long trip, like F. M. Chapman, to Bird Rock, fifty miles northwest of Cape Breton, to photograph with great difficulty for the first time the gannets, kittiwakes, murrens and puffins breeding there in peace; or, like Herbert K. Job, he waits in patience and discomfort for the shy grebes and loons of North Dakota to resume their disturbed floating nests in a vast marsh. The methods of their work—these courageous investigators and others—are not withheld from the public, but are scarcely within the reach of this little book, dealing, as it does, mainly, with the problems nearer to the most of us. I may, therefore, dismiss bird-photography with regret, for it is a fascinating subject, and refer the earnest seeker for additional knowledge to several of the books cited at the end of this monograph.

Photographing Although the domestic animals al-
Mammals ready discussed are mostly mammals—that is, warm-blooded animals suckling their young—I intend to include in this section the

wild animals of America. Recent literature has given us astonishing proof of the courage, hardihood and skill of those naturalists who will follow any animal, seemingly, until pictures are obtained, regardless of danger or toil. Mr. A. G. Wallihan, for instance, whose work I have mentioned before, has to his credit some truly marvelous hunting and finding—for he has hung on with grim tenacity, “toting” an 8 x 10 outfit through deep snow, amid bitter cold and in desperate straits, until his plates have recorded the elk, antelope, cougar and wildcat in full life and action in their native surroundings. No more inspiring and thrilling reading have I had than his plain and unassuming story in “Camera Shots at Big Game,” with its startling and superb illustrations.

Animals But this work far afield is hardly for
Near By many of us, yet all about are interesting animals, sometimes all the more wild because of their proximity to civilization, alas! We can try for pictures of rabbits, muskrats, squirrels and the like, and there are the interesting rodents to consider. If any of us, then, shall take up this branch seriously, there is a great and little-explored field in pursuing the same course as Wallihan and Carlin and others who have added much to the sum of human knowledge. Upon this work, and in relation to the increasingly fine opportunities afforded by our rapidly improving zoölogical gardens, I may again take from Mr. Brownell:

“Owing to the difficulty in obtaining satisfactory pictures of the animals in their wild state, the field for good camera work in this especial branch is enormous. Unfortunately, the obstacles are very numerous, and the good results that are obtained are few.

Photographing “There is, however, another field
in “Zoos” which is prolific, and in which but little, comparatively, has been done, and that is photographing animals in captivity in the various zoölogical gardens. The surroundings in the parks as they are now being kept are so true to nature that some very excellent results may be obtained.

“It is unfortunate that the Bronx Park, ostensibly

opened for the benefit of the public, should be closed to photographers, but there are other parks in the country which are open, and where every facility is given to the photographer. Principal among these is the National Zoölogical Park in Washington, D. C., at which there has already been done some good work.

"The three most essential points to be considered are: First, the pose of the animal, one characteristic of the species being of the most importance; second, the surroundings, which should always be natural and with no disturbing element, such as a fence or other sign of civilization, in the background; and third, the light, which should be somewhat diffused, though the picture should never be entirely flat.

"In working in the zoölogical parks either the Reflex or the twin-lens camera is again most useful, but an ordinary apparatus may also be used with success.

Although in a great many instances the animals must be photographed behind the bars of their cages, these bars need not appear in the picture. The grizzly bear sent herewith* was photographed in Central Park, New York, and yet no evidence of a cage is shown. This was accomplished by holding the camera close up against the bars, so that the lens pointed between two of them, and making the exposure when the animal was at the back of the cage.

"When the fence at the opposite side of an enclosure shows it is almost impossible to eliminate it entirely from the picture. It can, however, be made so much out of focus, by enticing the animal to the other side, and photographing him as near to the camera as possible, that it will merely form a part of an indistinguishable mass of shadowy background, and will then in no way injure the general effect.

"The enclosures, however, in the modern zoos are, as a rule, so large that the operator may choose his own background with no danger of a fence entering into the composition of the picture.

"The captive birds are often so tame, especially

* Reproduced as one of our inserts,

among the water-fowl, that they may be closely approached without alarming them, and will often even allow one to set up a tripod and photograph them.

"The prairie dogs can very easily be taken by focusing upon the entrance to one of their burrows, and waiting for the occupant to come out, which will usually not be long. His first action upon emerging is to sit upon his haunches and look about for any signs of danger. In this position he will often remain immovable for a considerable length of time, affording an excellent opportunity for a picture.

"Photographers living in or near New York city can find no better subjects upon which to try their skill than the gray squirrels of Central Park. They are most interesting and friendly little fellows, and can nearly always be enticed to one by a free use of peanuts. They are easily photographed by placing a peanut at a spot upon which you have carefully focused; then, as the squirrel approaches to take it his picture can be caught.

Necessary Knowledge "To successfully photograph the wild animals one must know their habits, and where to find them. Should one attempt to hunt for the smaller creatures without an accurate knowledge of their daily lives he might tramp the woods for weeks and find nothing but the squirrels and chipmunks, while, did he but know it, he has passed time and again within a few feet of some tiny fur-bearer, who has watched him with inquisitive black eyes, in fear and trembling.

Telephoto Lens "It is necessary to use a lens with the longest possible focus in this work, and therefore, a telephoto is very useful. Never start out to photograph without carrying with you from seventy-five to one hundred feet of rubber tubing and a large bulb. The best bulb to use, and in fact the only one that I have found would work satisfactorily with such a length of tubing, is one of the large rubber syringes used for sprinkling plants. The nozzle can be cut off and a plug fitted to attach to the end of the tubing. This bulb will give a sufficient air-pressure.

Methods "With the smaller mammals various methods may be employed with more or less success to entice them to the point of focus, but the best is by the use of bait. Find the entrance to the burrow of some mouse or chipmunk. Should there be a small rock or stump near it, place the bait upon this and focus upon the bait. Now, carefully mask your camera, attach the tubing and retire to your place of concealment. The rest is merely a question of patient and quiet waiting until the owner of the burrow comes forth.

"With the squirrels the task is much easier, as they are far less suspicious and will often approach to within a few feet of an unconcealed camera after the bait. They will even, on occasion, allow the operator to approach close enough to them to obtain a fairly good sized image with the Reflex, without the aid of bait.

"The twin-lens camera is of great Raccoons, etc. service in photographing some of the larger mammals, such as the raccoons, opossums, porcupines and even rabbits. With these animals it is often possible to approach within a few feet and make an exposure with one of these appliances, whereas it would be impossible to do anything with the ordinary tripod camera. Raccoons, opossums, wild-cats, etc., may often be treed with the assistance of dogs, and then the work is comparatively easy. Let me warn any one trying this, however, not to trust a lynx too much, for while they are essentially cowardly animals, and will do almost anything rather than fight, they can occasionally be exceedingly nasty when cornered, and do serious damage.

Deer by Flashlight "Flashlight has been used with excellent results, especially in photographing deer, in connection with 'firelighting.' Firelighting, as every sportsman knows, is a method of hunting deer at night. A small fire, usually a lighted resinous pine knot, is placed in front of a mirror, by means of which the light is reflected into the deer's eyes. These creatures are very inquisitive and will invariably stand to investigate this, to them, extraordinary light, which dazzles their eyes so that they can see nothing

else.* They will even occasionally walk directly up to it. In order to successfully photograph them in this manner it is necessary to have two people working together, one to attend the firelight and flash, the other to work the camera.

"The focus of the camera must be fixed at any distance from twenty to thirty or forty feet, and the operator must judge when the deer is at that distance, for it is impossible to do any focusing at night.

"Mr. W. E. Carlin,* while upon a photographing and hunting trip in the Bitter Root mountains, made some very fine photographs of the white- and black-tailed deer. He worked entirely with a very long-distance telephoto lens and with its aid obtained his negatives at distances varying from twenty-five to one hundred and fifty yards from his subjects.

"Photographs of swimming caribou can be easily taken in Newfoundland, where the fine creatures are still plentiful, by following them in a canoe and taking snapshots with a Reflex. They are helpless while in the water, having all they can do to attend to swimming, and may therefore be approached with no danger.

"The one great thing to remember in photographing all wild creatures, is to get them in as natural and unconstrained an attitude as is possible. This can only be done when they are caught unawares, as they are invariably more or less frightened when they know what is going on, and this fright will inevitably show in the picture, either in an unnatural pose or some other unmistakable way."

Photographing Fishes Barely a decade ago the only fish-photographs were those made of stuffed museum specimens. Then came a suggestion, I think by an English worker, Mr. James A. Rooth, of photographing freshly caught fish by impaling them on nails, this giving results certainly no better than those obtained from carefully mounted specimens. As it is well known that many fishes change color rapidly and considerably in life, and lose it immediately when they die, all such photographs obviously fail to present the natural beauties and features. It was, I

*See some of Mr. Carlin's work in this number of THE PHOTO-MINIATURE.

believe, Dr. R. W. Shufeldt, of Washington, D. C., a most earnest and capable naturalist-photographer, who first pictured fish swimming in the water alive, and his work is yet at the front.

Know the Fish In this branch of our subject it is necessary again to impress the necessity of accurate knowledge of the fishes upon the prospective worker. He must know the animals, and know how they act and appear; he must study them with eye and text-book before he attempts the very difficult work of photographing them. Douglas English puts it thus:

"Treating the matter in the first place in its scientific and most important aspect, it is obviously necessary that, to give the photography of fish any real scientific value, the photographer should be more or less acquainted with the 'points' of a fish. It has been laid down that, from the ichthyological standpoint, a correct delineation of a fish should show, amongst others, the following important external characteristics: 1. The length of head, tail and fins in proportion to total length of body. 2. The general contour of the living specimen. 3. The number of rays in the fins. 4. The lateral line and the number of scales along it."

The Difficulties The clearest water intercepts much of the sun's light that passes through it, and the whitest glass is likewise retentive of the light rays. The ordinary aquarium, therefore, is utterly impossible for the photographing of fish. By stages the proper appliances were evolved, and the practice is now rather well settled. A French worker, M. Fabre Domergue, proposed in 1898 a plan for the use of magnesium powder in connection with a special aquarium, but it has little to commend it as compared with the practice of Dr. Shufeldt, Douglas English, A. R. Dugmore and others who have attained great success by simpler means.

In addition to the reduction of light above mentioned, we have to deal with extreme mobility in the subject. The fish never perches, as does the most active bird; it is always suspended in the water, and in more or less rapid motion. Even when the movement in the

water is imperceptible, the fins and the gills are going. Exposures, therefore, must be substantially instantaneous—a most elastic and ill-defined term, by the way, covering practically everything from a half second to $\frac{1}{1000}$ of a second in photographic practice!

A Simple Aquarium One of the successful forms of tank or aquarium, as evolved, follows the idea of the animalcule tank used in optical projection work. It is made as narrow as possible in consideration of the size of the fish to be pictured, and usually is adjustable to various widths, from an inch to four or five inches or more. The sides are formed of the clearest and thinnest plate-glass. That it may be too thin was shown in the course of some work done by Mr. Dugmore, when a brook trout he was photographing actually broke the glass, fortunately after an exposure had been made upon him!

For small fish, a tank is formed of two pieces of glass of convenient size, between which is clamped a piece of rubber hose or bicycle tire, U-shaped, thus forming the ends and bottom, and by compression making the device hold water. It is usual to introduce sand, pebbles, water plants and the like, such as would be naturally in the water from which the prospective subject has been taken. A reflecting background is placed beyond the tank, and great care is used to keep the glass perfectly clean.

Details of the Work In preparing for work, the lens is focused upon the tank, and it is moved about so as to avoid any reflections from the glass surfaces—it is essential that nothing but water appears as a confining medium. The apparatus is placed in the brightest light obtainable, out of direct sunlight, and the fish introduced. It is then only a matter of careful attention to attitude, and of quick exposure when the conditions and light are just right.

Fishes show terror, and require careful handling just as do other animals. One writer mentions the necessity of firm muscular control in placing them in the temporary aquaria, and all agree that water similar to that from which the fish is taken should be supplied, and that it must be kept fresh by renewals.

Mr. A. Radclyffe Dugmore presented **Tropical Fish** in *The World's Work* for July, 1901, a most remarkable and beautiful series of photographs of tropical fishes, in connection with which some interesting details were given, from which I quote :

"In making the accompanying photographs the fishes were placed in an aquarium, specially constructed for the purpose. Isochromatic plates were used in every instance, thereby giving fairly true color-values. The aquarium was lined with white cloth in order to reflect as much light as possible. When a fish such as a porgy was placed in it all the colors and markings instantly vanished, and instead of rich greens and purples, with more or less distinct bars, we had a plain, pale, silver-colored fish. A few pieces of rock were placed near the fish and some color reappeared; then weeds of various kinds were added and the color came back to the fish, not steadily, however, but rather in fits and starts. My illustration was taken when the fish's color was nearly at its best. All this applies not only to the porgy, but to many of the brightly colored and strongly marked scale-fishes. Needless to say, it caused me no end of difficulty in obtaining satisfactory photographs. The angel-fish are among the very few that changed but little, strange as it may appear, for they are the most brilliantly colored of any of the Key West fishes. The porgies of all kinds are very changeable. Some of the fishes, while they retain their markings to a certain degree, lose their colors almost entirely. This is especially true of the yellow-fin, grouper and the hinds. The spots do not disappear, but the ground color changes from a rich and fairly dark green to a pale, washed-out, dirty yellow that lacks all beauty.

"It can be seen by these remarks how great may be the variation in photographs of the same individual fish. One picture may show a plain silver fish lacking all marks; another may show indications of bars or stripes and yet not give the small markings of the head; and still a third may show the fish strongly barred, with fine, yet distinct lines about the head and gills. This is one of the greatest difficulties to be met with in fish-pho-

tography, for unless we know what the full coloring ought to be, we should be more than likely to make the exposure at a time when perhaps some of the most characteristic markings were entirely wanting."

Obviously the exposing tank or aquarium may be used for photographing other water creatures. Hermann V. Letkemann has made pictures of the curious living corals from Bermuda, at the New York Aquarium, and he has also shown some very excellent fish-pictures made at the same place.

Photographing Reptiles

The enthusiastic naturalist will want to extend his photographic studies to that portion of the animal kingdom included in the Biblical condemnation following the original snake trouble, and he will find, his repugnance once overcome, a great and almost untouched field, full of interest, and with sufficient spice of danger to make it anything but monotonous. Seldom have I read a more vitally thrilling story of photography than that entitled "Hunting Rattlesnakes with a Camera," published in *Country Life in America* for April, 1902, and detailing the personal experiences of the writer, Mr. W. H. Backus. The article is accompanied by some wonderful photographs of live rattlers, and the enthusiasm of Mr. Backus can be inferred from this quotation:

"I have now been studying rattlesnakes for several years, and in the summer of 1901 I went out better prepared than ever before to watch them and get photographs, but before I had fairly started I had the misfortune to be bitten by one. This cut my studies short and nearly ended them altogether, as I was far from help except a boy who was with me. But it has added to my interest, and I expect to go again next summer with a camera better suited to that class of work."

Harmless Snakes

Only enthusiasts will hunt for venomous snakes in the wild, but many naturalists will gladly study the harmless reptiles with the camera. As the inconspicuous nature of the subjects and their shyness renders them difficult to find and to photograph at large, what is

known as the "control" method seems most feasible. All who have undertaken this work agree that snakes and other reptiles are very easily tamed and make interesting pets. Says one worker: "An average specimen will get to recognize its keeper within a fortnight, and within a month will become so tame as not to attempt to escape when handled."

It is well to know that venomous snakes are few in the eastern United States, the copperhead and the rattlesnake, both easily recognizable (the former by the iridescent spot on its head which gives it name, and the latter by its unmistakable and thrilling rattle of warning), being the only ones, according to Mr. L. W. Brownell. To quote him further: "All the rest of the snakes are harmless, and although they may strike viciously at one and often take hold with their teeth, their bite is no more to be feared than a pin-prick."

The method most productive of successful results with snakes, lizards and the like is to bring them to a studio arranged outdoors, and to have them become somewhat acquainted with the worker before the photographic attempt is made. As nearly all of these subjects have shiny scales, from which sunlight reflects unpleasantly glittering points of light, the work must be done in diffused light, and as extreme quickness and mobility is likewise characteristic, the brightest possible soft light and the quickest possible exposures are indicated—a difficult but possible combination.

For the smaller reptiles a very suitable arrangement is that suggested by Mr. English, consisting of a rectangular case, preferably with glass sides and wooden ends, in the latter being cut openings covered by strong rubber cloth with a slit through which the lens of the camera may be thrust. The bottom of this box is usually lined with earth or with neutral-tinted plaster of Paris, the material being rounded up against the ends. A central partition of glass is provided, to be slipped in quickly when it is essential to confine the animal in half the space of the box. The top is of two pieces of glass simply laid on, and useful for admitting light and

subjects at will. Supported at a convenient height on a table or a box, this apparatus may be moved about readily, and by the introduction of twigs, stones, grasses, etc., natural conditions may be simulated. Frogs, newts, lizards, toads, small snakes, etc., can be readily photographed in this arrangement.

An Outdoor Studio With sufficient skill and familiarity with the reptiles to be pictured, excellent results are obtained by working in an improvised outdoor studio, provided only with a stand of convenient height upon which to pose the subjects. Tree branches and the like natural accessories will suggest themselves. A white sheet background will add to the light and cut off out-of-focus distance.

Photographing Insects A field of great possibilities, hardly touched as yet, is open to the naturalist who will turn his attention to the vast insect creation. Subjects of wonderful delicacy of construction and color await the lens and the plate; difficulties of capture and control as great as those surrounding the larger members of the animal kingdom beset the worker; rewards in the way of interesting pictures and additions to scientific knowledge are within full reach. The subjects, too, are not far to seek.

Mr. Brownell's notes are explicit upon this point, and I am glad to present his suggestions:

"Here, again, the Reflex or twin-lens cameras can be used advantageously. With one of them one may approach to within a foot or two of a butterfly or bee perched upon some blossom, and obtain a picture which it would be impossible to get by any other means.

Subjects "Any one who is enough of an entomologist to know where and when to look for the insects will never lack for subjects, but can go forth upon any day during the spring, summer or autumn and make many exposures.

"The butterflies are, naturally, the most interesting subjects, and the most perfect specimens are those which are raised under cover from the larvæ or caterpillars. This is not difficult work for the photographer; he simply sees that the caterpillars have sufficient of their food-plant and fresh leaves contin-

ually. This latter precaution is necessary from the fact that a caterpillar never drinks, but gathers his supply of liquid nourishment from the juices of the leaves. Immediately upon emerging from the pupa case, the wings of the butterfly are in a most deplorable condition, being wet and wrinkled. In a few minutes they will straighten out, but for several hours will remain too weak to bear the weight of the butterfly. During this period the most satisfactory photographic results may be obtained, as the insect can be placed on a blossom or leaf with no fear of his flying away.

"Both butterflies and moths may be advantageously photographed at night by means of a flashlight.

The
Photographic
Life-History

"Most useful, scientifically, are a series of photographs showing the different stages in the metamorphosis of a butterfly or moth. In order to make

this invaluable one should obtain the eggs, hatch the caterpillars, and then take life-sized pictures of the worm immediately after each molt; as he appears directly prior to pupating; the pupa as it appears when newly formed; later when dry; the butterfly emerging therefrom, and in the various stages during the process of drying his wings, and, finally, the perfect insect just before his flight.

"In this manner and by means that the ingenious camerist will devise, can the ways of other insects be truthfully depicted—the digger wasp digging her nest in the sand, and, later, carrying a locust into it; the mud wasps making their plaster nest; the hornets adding layer after layer to their paper-like nests; the cicada, or locust, emerging from its shell; the dragonflies swaying upon the tip of some drooping grass stem or twig; the beetles carrying out their various vocations in life, and, in fact, the thousand and one other interesting subjects that are constantly in sight.

Spiders

"Spiders are very interesting fellows to photograph, and to have them in their webs greatly enhances the value of the pictures, as well as the interest. Here a black background is necessary, as the white web will not show to good advantage against a light background."

Collecting
Insects

Many insects will be impracticable for photographic study in the field, and some will be impossible while alive. The entomologist's apparatus of catching net, killing bottle, etc., will serve in such cases, and the photographer will find a use for wide-mouthed bottles. The apparatus for photographing downward, previously mentioned, will be found very convenient.

In closing these notes I can only hope that this great field for photographers, "the new hunting," with

everything to commend it to the real lover of nature, may be vigorously cultivated, for the rapidly increasing perfection of apparatus and the tremendous growth in opportunity for the use of good animal photographs provide a great impetus to the worker's enthusiasm. He will be close to nature, and his reward, even if he does not always get satisfactory pictures, will be great in added health and knowledge.

J. HORACE MCFARLAND.

BOOKS

"Wild Life at Home." (Photographing birds in their native haunts.) By R. Kearton, F. Z. S. Fully illustrated throughout. 1899. \$1.50.

"Our Rarer British Breeding Birds." Their nests, eggs and summer haunts. By R. Kearton, F. Z. S. Profusely illustrated from photographs. 1899. \$2.00.

"Bird Studies with a Camera." With an introductory chapter on outfit and methods. By Frank M. Chapman. Illustrated. 218 pp. Cloth, \$1.75.

"Camera Shots at Big Game." By A. G. Wallihan. With an introduction by Theodore Roosevelt. 76 pp. 8 x 11; profusely illustrated with engravings and photographs from photographs. 1901. Cloth, \$10, net.

"Photography for Naturalists." By Douglas English. A complete survey of nature-photography, with many illustrations from life. 131 pp. (English) 1901. \$2.50.

"Among the Water-Fowl." By Herbert K. Job. With about 100 illustrations. 1902. Cloth, \$1.35, net.

NOTES

The Photogram for July contains many features of interest. Chief among these is a Directory of Public Dark-Rooms in Great Britain and Continental Europe, where travelers can obtain facilities for changing and developing plates *en tour*. It is proposed to make this Directory a permanent and international affair, the coöperation of amateurs, dealers offering dark-rooms, etc., being invited. A sign of special design is provided for those having dark-room accommodation. Full particulars of the scheme, which we heartily commend to photographers everywhere, can be had from the American branch, *Camera Craft*, San Francisco, or *The Photogram*, London, England.

Another valuable feature of the current *Photogram* is a negative chart, reproducing seven incorrectly exposed and developed plates in facsimile for comparison and reference. [Spon & Chamberlain, 123 Liberty street, New York. Price, 15 cents.]

The Thornton-Pickard Manufacturing Company (Andrew J. Lloyd & Company, Boston, American agents) has perfected and patented a focal-plane shutter in which the modification of the blind aperture is effected simply by turning a knob on the right-hand side of the shutter-box. Apart from this desirable improvement the new shutter is so compactly constructed as to be simpler in operation and less liable to get out of order. The instrument works at speeds varying from $\frac{1}{20}$ to $\frac{1}{1000}$ of a second, which points to an obvious advantage possessed by this shutter over those which have to be set at $\frac{1}{1000}$ of a second for their operation in cases where $\frac{1}{300}$ or $\frac{1}{400}$ of a second's exposure would suffice.

We have received the first two numbers of *Photo-Borse*, a German journal devoted to the photographic trade of that country, and similar in scope to the English *Photographic Dealer*. The magazine consists of some twenty-four pages of information interesting to manufacturers and dealers, and is published in Berlin [Deutschen Photo-Verlag, Schöneberg].



A useful paper on ferric and heliographic processes, with a description and drawings of machines for coating blue-paper, by Alfred I. Cohn, appeared in the journal of the Society of Chemical Industry, New York, May 15, last.



The following summary of methods available for the saving of "wastes" or residues in photography may be useful to amateurs. They are extracted from notes on the subject by Frederick Graves, published in the *British Journal of Photography*.

First, then, in the case of old fixing baths, and old solutions of hypo, the first proceeding is to add a small quantity of strong solution of sulphide of potassium to the store of old hypo; this store should be kept in a deep jar. In adding the sulphide we shall get the silver precipitated as a dense brown flocculent mass, and this, after being well stirred up, should be allowed to settle. This sulphide of silver must be collected on a filter and allowed to dry. If we wish to go farther we may mix the filtrate with equal weight of two parts of carbonate of soda and one part of nitrate of potash, and fuse the mass in a crucible.

For old toning and fixing baths, as those containing sulphocyanide, we must mix with a little hydrochloric acid and sulphate of iron, and metallic gold will be precipitated mixed with hydrous perchloride of iron. This, on being collected and dried, can also be fused in a crucible.

For acid fixing baths (as platinotype, etc.) we add ferrous developing solution, and get platinum formed, but this is mixed with more or less iron, and the iron

will have to be eliminated by the use of sulphuric acid and by thorough washing.

Solid residues, such as print trimmings, etc., must be burnt, and the ashes mixed with carbonate of soda and nitrate of potash, as above, and fused.

In the case of the silver in plates, films, etc., they should be dissolved in hydrochloric acid, to which, after a time, an equal quantity of sulphuric acid is added, and heat applied. Whatever silver forms at the bottom of the vessel should settle and be collected. By mixing this with charcoal and sawdust, and heating to redness, we shall reduce a globule of pure silver in the crucible.

There are, of course, other methods of reducing and collecting residues and their elementary constituents, but for the non-chemical amateur I think these means are about the simplest and best.



In a letter telling us of a big amount of commercial work outlined for the summer, Mr. E. J. Davison, of Kansas City, says: "The greatest photographic trio that I know of is Seed's non-halation ortho plate, Seed's pure sodas, and the Zeiss convertible lens. With these at hand the biggest difficulties become comparatively simple."



The Tenth Annual Photographic Salon will be held at Egyptian Hall, Piccadilly, London, from the 19th of September to the 1st of November, inclusive. American exhibits should be expressed on or before August 15 to Messrs. Bourlet & Sons, 18 Nassau street, Middlesex Hospital, London, W. Entry blanks and full information concerning the exhibition can be obtained from Mr. Alfred Stieglitz, 3 West 29th street, New York.



The executive committee of the Photographers' Association of New England are arranging to have, in connection with their convention to be held in Boston, August 20 to 22, a representative exhibition of photographs by New England amateurs and professionals.

To this end amateurs in the New England states are specially invited to send one representative example of their work for exhibition. A charge of one dollar is made to cover the expenses attaching to each individual exhibit. Selected pictures will receive a diploma or certificate of honorable mention. Full particulars can be had from the secretary, Mr. George M. Bolton, Rockville, Conn.



To those who, like the scribe, are reveling in the annual holiday, the subjoined paragraph from *Country Life in America* will appeal with special interest:

"Following the old pasture road away from the dust of the highways, little side excursions may result in any number of finds of wild flowers. There are the pearly everlasting and its close cousin, the clammy everlasting, the bright yellow tansy, escaped from some garden, the wild teasel, the common bright-hued pink knotweed or persicaria, the burr or spear thistle and its two near relatives, the Canada and pasture or fragrant thistles, the acrid Indian or wild tobacco, the sensitive pea, the common burdock, the chicory which so often passes muster in your morning cup, and the whorled or green-flowered milkweed. Where the ground is a bit rocky look for the stiff or savory-leaved aster and the upland white aster. Dry open spots are already brightened by two goldenrods, the sweet and the low-growing gray or field goldenrod. The wild or American senna brightens rich moist spots, and perchance it has as near neighbors the Virginia ground-cherry and that floral vagabond the beggar-tick. In sandy fields look for the bastard pennyroyal and the false pennyroyal, the latter dwelling near streams. The elecampane or horse-heal blooms along fences and the muskmallow by the roadside. That brilliant pest of the grain fields, the corn cockle, is in bloom, while in the dusk of eventide the fragrant night-flowering catchfly is to be found in waste places."

In this profusion of color the orthochromatic plate is not a virtue so much as a necessity, and oftentimes a screen will help even the best of orthochromatic plates.

At a recent meeting of the L. and P. Association (London) Dr. Ed. F. Grün described his fluid lens and illustrated its performance by photographing the meeting by the light of seven ordinary gas-burners, giving an exposure of 10 seconds. An illustrated paper on this lens, by Dr. Grün, may be seen in *Wilson's* for May.



A helpful paragraph on picture-making is given at the end of an article on this subject by Mr. H. Stewart Wallace, printed in the *Transactions of the Edinburgh Photographic Society*. Mr. Wallace says: "The careful following of the most elaborate rules of composition will never in itself make a picture. There must be something more. You must set to work, not so much in the spirit of one who desires merely to get a good photograph, as in the broader spirit of one who worships at the shrine of nature. Let your love and not your camera draw you to your subject. Remember that you will succeed best in that class of subject which moves you most in nature, and so you will be furthering your study of the true art of photography if you spend an hour in gazing at a scene which appeals to you even though it be utterly beyond the scope of your camera, for you will be learning to enter into the inner circle. Others who merely study the rules of composition, and talk the art jargon of massing their lights and shades and obtaining their delicate half-tones, may, if they choose, claim an acquaintanceship, it may even be an intimate acquaintanceship, with nature, but you will be far on the road to friendship, and unless you can attain to these terms you will always fail to give full expression to the true spirit of nature, for to none but a friend will she reveal her secrets."



A handsome booklet, interestingly written and illustrated, comes to our table from the Bausch & Lomb Optical Co., Rochester. It describes the Volute and other photographic shutters made by this well-known firm, and is full of useful information on its subject.

Tennant and Ward's List OF NEW BOOKS AND PUBLICATIONS

THE LADY POVERTY. A XIIIth Century Allegory, telling how St. Francis of Assisi wooed and won that most difficult of all brides, my Lady Poverty. A delightful volume for all interested in Franciscan and mediæval literature. Written A.D. 1227, now rendered into English for the first time. Translated and edited by MONTGOMERY CARMICHAEL. 209 pp. Cloth. *Net*, \$1.75.

AMERICAN PICTORIAL PHOTOGRAPHY. Representative examples of the work of the American School of Pictorial Photography. Selected by and reproduced in photogravure under the personal supervision of ALFRED STIEGLITZ, and formerly published by "Camera Notes." Series I, *net*, \$10. Series II, *net*, \$6. The edition was limited to 150 copies of each series, and only a few sets are obtainable. Descriptive circular on request.

THE "CAMERA NOTES" IMPROVED GLYCERINE PROCESS for the development of platinum prints, including the experiments of ALFRED STIEGLITZ and JOSEPH T. KEILEY. Illustrated with facsimile reproductions in color, by the experimenters. Reprinted from "Camera Notes." Only a few copies obtainable. Paper covers, *net*, \$1.

AN INDEX OF STANDARD PHOTOGRAMS. Being a guide for Authors, Editors and Publishers of Illustrated Books and Periodicals, Collectors of Pictures, etc., listing photographs available for publication purposes. Sold by subscription only. Particulars on request.

PHOTOGRAPHY FOR NATURALISTS. By DOUGLAS ENGLISH. A book for those interested in photographing animals, etc. 132 pp., fully illustrated. \$2.50.

ELEMENTARY PHOTOGRAPHY. By ERNEST MARRIAGE. The most useful book on this subject. 148 pp. 26 plates. \$1.75.

PRACTICAL NOTES ON TELEPHOTOGRAPHY. By BECK LTD. A pocket-book of practical information. Cloth, 25 cents.

[READY IN JULY.]

THE A B C OF PHOTO-MICROGRAPHY. A practical handbook for beginners, by W. H. WALMSLEY. With plain instructions and many engravings. About 130 pp. Cloth, *net*, \$1.25.

PHOTOGRAPHIC APPARATUS, its making and repairing, by various English writers. Cloth, *net*, \$1.

FINISHING THE NEGATIVE. An encyclopedic treatise on all the processes between development and printing. Edited by GEORGE E. BROWN. 160 pp. Cloth, *net*, \$1.25.

THE LENS. A practical guide to the choice, use and testing of photographic objectives. By GEORGE E. BROWN and THOMAS BOLAS. Profusely illustrated. 130 pp. Cloth, *net*, \$1.25.

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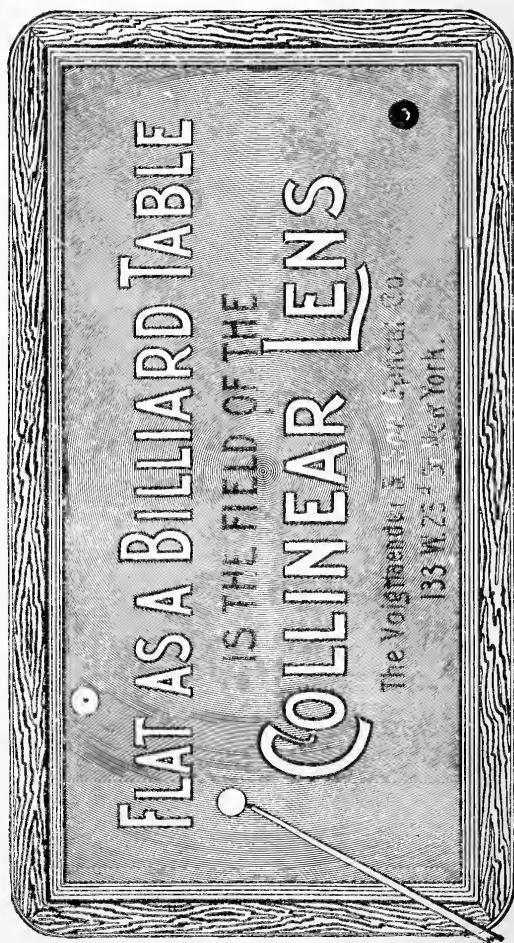
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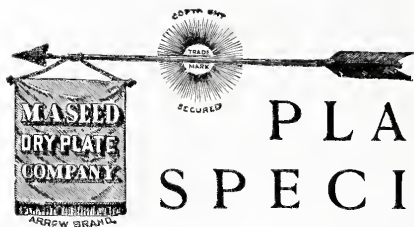
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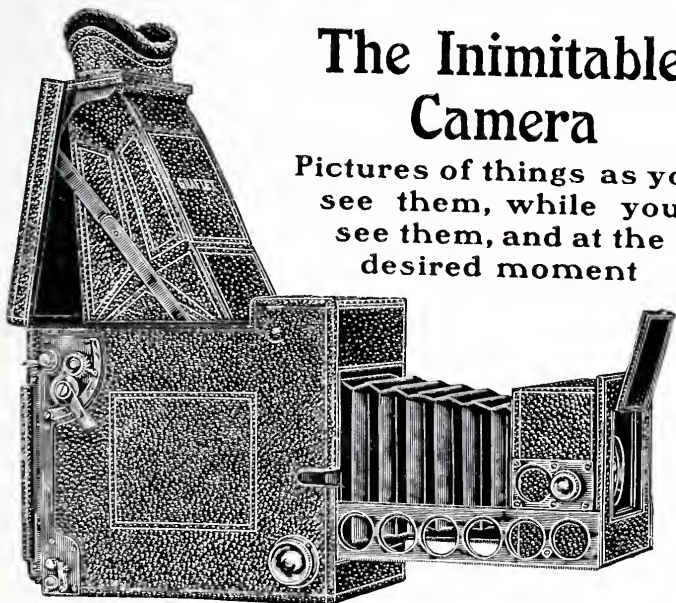
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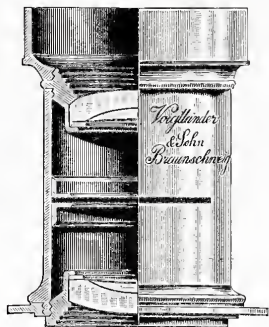
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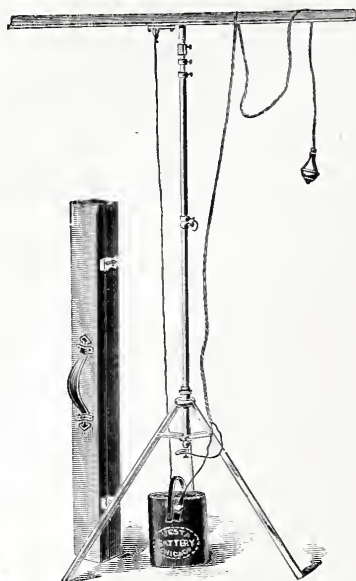
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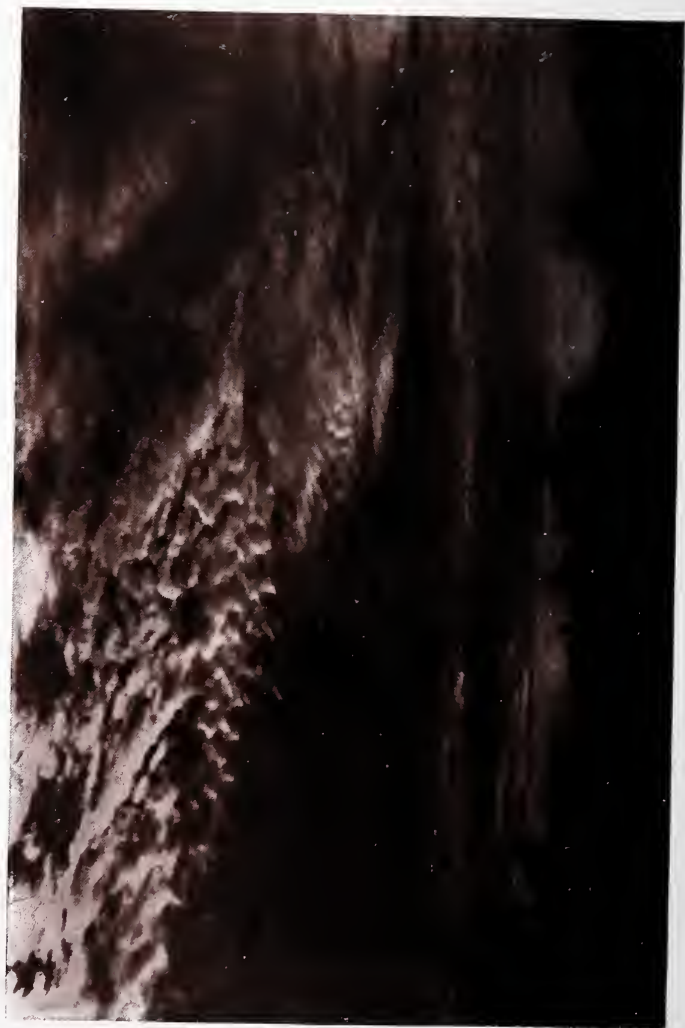
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Volume IV

JULY, 1902

Number 40

PLATINOTYPE MODIFICATIONS

The wonderland of photographic manipulation grows in interest and fascination as we journey along its highways and byways. The chief charm of photography, in fact, is that there is no finality to its pleasures. No sooner do we turn a corner on the road than a new view opens out before us, revealing new enchantments and possibilities we had not dreamed of on the way.

This is especially true of the processes of printing in platinum, with which we are all broadly familiar. There are many good platinum papers in the market, and their successful manipulation is fairly well understood; but there is a widespread notion that they limit us to prints in black and white, or so-called sepia. It is time to remove these limitations, which have persisted largely because of the conservatism of manufacturers opposed to experiments with their papers beyond the boundaries laid down in their "instructions for use." There are wonderful color-possibilities in platinum papers and an abundance of room for desirable modifications. Some of these, well tried by experience, are to be described in the following pages. I think the story will make one of the most profitable little books in this series.

In the monograph on "Platinotype Processes," published in THE PHOTO-MINIATURE series over two years ago, the general manipulation of platinum papers was explained in the simplest and plainest terms. The generous appreciation given to that number seems to prove that it was needed. Unless I am mistaken, there is as great a need for the little book here attempted.

"The platinotype processes offer us at once the simplest, most direct and most satisfactory means of producing from our negatives, prints which are indisputably permanent and beautiful." This was written in the earlier monograph. After so bold a claim there may be some who question the desirability of platinotype modifications, or the necessity for a separate monograph devoted to their consideration. A patient reading of what follows will completely justify the work here undertaken, which is simply intended as a supplement to the earlier work. For the most part the monograph is the work of Mr. Osborne I. Yellott, but special mention must be made of the valuable contribution of Mr. James H. McCorkle, concerning his method of securing platinotypes in colors with uranium. The prints furnished by Mr. McCorkle for the illustration of his notes are remarkable as a demonstration of the practical value of his methods, but necessity compels a word of apology for the shortcomings of the reproductions. These, despite the best endeavor of engravers and printers, barely suggest the results secured by Mr. McCorkle. The notes on home-prepared papers, by Miss Stanbery, are also included in this acknowledgement of help given. The reader must give the various methods a practical test. I can promise him an abundant reward for his patience and care.

The Question of Expense The platinotype process is ordinarily considered an expensive one. The great beauty of the perfect platinotype print and the great ease with which the paper is manipulated, are in many cases insufficient to outweigh this most important factor. But when we consider that a thorough knowledge of the modifications of which the process is susceptible will enable the worker to correct practically all errors in both printing and developing, so that only by the greatest carelessness can any considerable proportion of prints be wholly lost, it will be seen that the process is, in fact, a most economical one.

Other View-Points But there are other reasons for resorting to modifications of the platinum process. The position which photography has taken as a medium of artistic expression requires

that its several processes should yield themselves to the individuality of those using them. To the worker possessing individuality the platinum processes offer endless advantages by reason of the ease with which their results can be modified to suit the individual taste or the necessities of the subject. Not only can we modify the color and general character of the print to meet the requirements of the subject, but by the use of glycerine in development we are enabled to modify even the lines and masses of the picture itself.

And then again, the amateur who has neither the time nor the desire to take up the art side of photography seriously, but who is beginning to tire of turning out mere records of fact in monotonous black and white, will find that in the modifications available in platinum printing he can add endless variety to his collection of prints, thereby increasing his own interest and the interest of his friends in his work.

On the other hand, the professional who by the exigencies of competition must always have something new in his show-cases, will find in the modification of the platinum processes novelties enough to last him for several seasons with the minimum of labor.

Finally, we have the fact that the exquisite tonality of the platinum print is retained in nearly every modification which will be suggested. Nay, more, the modified platinum print is sometimes far more pleasing than the ordinary print, because of its color. Hence it follows that, if there is any reason at all for modifying any print for the sake of variation in results, there are the best reasons why the platinum print should be chosen as the basis of the modification.

The Scope of Our Field In preparing this monograph it has been assumed that the reader is thoroughly familiar with the platinotype processes as ordinarily understood. If he is not, I must refer him to *THE PHOTO-MINIATURE*, Vol. I, No. 7: *Platinotype Processes*, wherein are contained full and detailed instructions for working the several methods. In this monograph it is proposed to take up the subject where that one left off, repeating only where necessary for completeness, and supplementing the latter with

more detailed instructions as to some of the modifications therein suggested. In the earlier monograph several kinds of paper were dealt with; in these pages we will confine our attention to the modifications possible with a single class, viz., the cold-development paper such as that made by Willis & Clements, Bradley, The American Aristotype Co., and di Nunzio in America; by The Platinotype Co., Ilford, Ltd., and Jacoby in Britain, all yielding black tones under normal conditions and as ordinarily worked. While it is possible to use some of the modifications hereinafter referred to with some of the other classes of paper, the cold-development paper is the only one with which all the modifications suggested can be worked successfully. It will therefore be less confusing to the reader if he will consider that what follows refers to that class of paper particularly, unless otherwise stated. Later, he can try for himself with the other papers such modifications as seem applicable.

If the worker is so experienced in the
Sepia Papers use of platinum paper that he does not fear failures, and desires no change from the normal black and gray of the platinotype other than an occasional print of a warm tone, he will naturally resort to the paper especially prepared to give sepia tones when normally developed. These "sepia" papers, while a little more difficult in manipulation than the cold-development papers, give satisfactory results, and are recommended by the writer for the purposes for which they are intended. Inasmuch as full directions for working the different "sepia" papers come with each variety, it would be useless to repeat those directions here.

In using sepia papers it is well, however, to bear in mind that three factors influence the degree of warmth in the final tones: First, the depth of printing; second, the temperature of the developing solution; and third, the amount of sepia solution used in the developer. To get lighter sepia tones than the normal, print less deeply than usual, use less than the normal amount of sepia solution in the developer, and develop with the solution at between 130° and 140° Fahr. For darker and richer tones print more deeply, increase the amount of

sepia solution somewhat, and raise the temperature of the developer to from 160° to 175° Fahr. For colder tones with the sepia paper, Beanland recommends the following: Potassium oxalate, 30 grains; oxalic acid, 2 grains; water, 140 minims, to which add 60 minims of glycerine, applying it carefully with a soft brush or tuft of absorbent cotton.

In England Jacoby's platinum paper has long been known and extensively used. Within the past few months branch agencies for its sale have been established in New York and Chicago, and it will no doubt before long be found in all the more progressive stock-houses. It comes in sheets 20 x 26, six and twelve sheets to the can, and must be cut to size. The Jacoby paper yields exquisite sepia tones with cold development, thus avoiding the necessity of using hot baths, as is the case with other papers. The paper is made in three grades, Heavy Rough Whatman Sepia; Medium Heavy Rough Sepia, and Heavy Rough Black. The Heavy Rough Whatman in sepia is most admirably adapted for use with negatives not smaller than 10 x 12, and gives broad and sketchy effects. I have recently used this grade of the paper with some enlarged paper negatives where simplicity and breadth of effect were the chief desiderata, and can heartily recommend it to those who are preparing large prints for exhibition purposes. Photographs so made have all the charm of wash drawings on the heaviest drawing-papers.

The stock developing solution for the sepia paper is: Water, 50 ounces; oxalate of potash, 17 ounces; oxalic acid (saturated solution, 1 to 8), 5 ounces. The oxalic acid acidifies the developer and more or less should be added according to the thickness of the paper. For the black-tone paper any of the ordinary developing formulæ can be used. Full directions and all necessary formulæ come with the paper.

Owing to the large amount of solution required in the development of the large sizes, and for the purpose of better controlling or modifying final results, I advise adding to the developer an equal quantity of glycerine, pinning the paper to a board and developing

with a broad camels-hair brush, such as is used for dusting plates. Of this more hereafter.

Very pleasant variations in tone-effects can be obtained by the use of black-tone platinotype paper from four months to a year old, the result secured being entirely unlike the warmer tones procured by any of the development or toning methods. By old paper is meant that which has been kept in the tubes and thus protected from dampness for some months. The worker would ordinarily call it spoiled paper, and be likely to throw it away, but such paper can be made very useful in those cases where a warmer tone is desired and a slight degradation of the high lights is of no moment. For instance, it can be used in architectural subjects of certain kinds, the copying of old engravings, manuscripts, and the like. It is also used in many cases by advanced amateurs who seek individuality of expression rather than what is generally considered technical perfection. The depth to which such paper shall be printed depends upon the subject. Development is best effected by the use of the solution slightly warmer than the normal.

All the directions for the use of platinum paper caution the worker most explicitly against allowing the paper to become damp at any stage before development. Nevertheless, it sometimes happens in seasons or localities of considerable humidity that the paper will become slightly damp, the result in the prints being a muddy brownish tone in the shadows and a degradation of the high lights. Beanland suggests that paper in this condition be printed rather more deeply than usual and developed with a heated developer. This treatment gives rather more character to the shadows, making them of a warmer black color, and if used in cases where it is not important to preserve the purity of the high lights, gives quite pleasant results. It is suggested for use in landscapes with heavy clouds and low-toned effects in portraiture. Full and explicit directions for drying and using platinum paper which has inadvertently become damp are given in THE PHOTO-MINIATURE No. 7, page 344.

Modifications in Printing A slight degree of control over final results can be obtained in printing the paper. A strong, contrasty negative should be printed in direct sunlight, a weak one in the shade. If the negative is very thin it should be printed under several sheets of tissue paper or the Restraining Tissues introduced by Newcomb. In such cases, as well as when there is any appreciable humidity in the atmosphere, the paper should be protected from dampness during printing by means of a rubber pad, or a sheet of thin celluloid film such as a spoiled film negative. Strong negatives may be printed advantageously under a sheet of green glass, the tendency being to yield much softer and grayer prints with more detail in the shadows. A sheet of blue glass on the other hand may be used advantageously with thin, flat negatives lacking contrast, the result being prints with the maximum of contrast. Blue glass should not be used indiscriminately with pyro-stained negatives, as the printing light is then green. Yellow glass should not be used with platinotype paper, as it causes coarseness and granularity in the prints. For this reason pyro-stained negatives are frequently found to yield disappointing prints in platinotype, the green-black image being most preferred for vigorous prints.

Printing by Artificial Light It is not generally known that platinotype paper can be printed by artificial light, but such is the case. A rather plucky and brilliant negative, taking two minutes to print on Willis & Clements' K K platinotype in April sunlight at noon, was fully printed and gave the same result on that paper when exposed for eight minutes at one foot from an alternating current arc-light of about 1200 candle-power. As the frame was moved further from the light it was found that there was a marked increase in the contrasts, the time of printing increasing with the square of the distance. The method is recommended to those who have an arc-light available but whose hours for daylight printing are limited. Half a dozen or more frames can be fastened to an enlarging easel placed at a distance of a foot or so from an arc-light, and the prints will come along about as rapidly as

they are wanted. The method is also suggested for use in photographic clubs having an arc-light for enlarging or other purposes. Prints can be made on platinotype paper by exposure to acetylene gaslight, but even at a distance of one foot with thin negatives, the time of exposure runs up to an hour or more. I have, however, made as many as half a dozen prints in an evening without much trouble by grouping several frames around an acetylene drop-light and allowing them to print while busied with other work.

Temperature of Developer The temperature of the developer has a very marked effect upon the tone of platinotype prints made on cold-development paper. The normal temperature of the developer is between 60° and 70° Fahr. With a fairly good negative properly printed, this yields a print with pure blacks in the deeper shadows, pure high lights and intermediate grays. Lowering the temperature does no good. On the contrary, it makes the prints granular or mealy, caused no doubt by the failure of the developer to act upon the platinum salts before they are partially washed away in the solution. Raising the temperature of the developer to 90° Fahr. will give a very slight degree of warmth in the shadows. Increased to 120° Fahr. it will render the prints noticeably warm in tone, and from that point the developer can be raised in temperature to the boiling point and poured directly on the print without harming it, the result being a steady increase in warmth of tone. With the rough paper this warmth seems to be more noticeable than with the smooth, and a great deal of it is undoubtedly due both to the character of the print and the depth to which the printing is carried.

A developer heated to 90° Fahr. can be used to save prints which have been slightly undertimed. If it is desired to get soft prints from harsh negatives, the print should be slightly undertimed and developed in strong developer heated almost to the boiling point. This treatment yields rich warm shadows and full detail in the high lights. It is far better than printing for the higher lights and running the risk of bronzing the shadows by normal development.





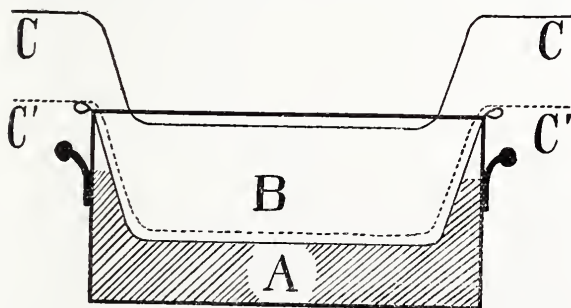




Four prints from the same negative, showing some of the variations in color and effect obtained with uranium
James H. McCorkle

A Convenience in Development

In developing with hot solutions difficulty is frequently experienced in keeping them up to the required degree of temperature. When making only two or three prints it is usual to heat the developer over a spirit-lamp or oil-stove and when the right temperature is reached, pour it over the print to be developed. But this method is cumbersome and never thoroughly satisfactory. The best plan to keep the entire solution at an even temperature throughout is to use a porcelain-lined metal tray for the developer, and place this in a slightly larger metal tray containing



water, or better still, a mixture of sand and water of about the consistency of slush. The two trays are then placed over an oil- or gas-stove, and when the developing solution reaches the desired temperature, the flame is turned down far enough to maintain the temperature at about that point. The sand-bath holds its heat for so long that, if more convenient, it can be taken off the stove and used elsewhere until the temperature of the developing solution is materially lowered. A tinsmith, for a comparatively small consideration, will make a deep tin or sheet-iron pan with handles on the sides which will suit the purpose better than any home-made contrivance. A glance at the accompanying illustration will give the idea. As solutions over 130° Fahr. are painful to the fingers, it is well to have some arrangement for removing the paper from the hot developer

where it is immersed instead of being floated. The tinsmith for a few cents extra will make this. It consists of a piece of zinc a little narrower than the bottom of the tray, bent in the manner shown in the illustration and perforated to allow the developer to drain off freely.

Varying the Strength of Developers The modification of the final results can be controlled by varying the strength of the developer. If a simple solution of neutral oxalate of potash is used instead of the developing salts sold by the makers of the papers, the stock solution should be a saturated one. But if the prepared salts are used it will be found of advantage to dissolve them in one-half the quantity of water recommended by the makers. For the development of prints from a perfect negative, the stock solution so prepared should be diluted with an equal quantity of water and will then be the strength recommended for the paper. In the case of a dense, contrasty negative with which detail in the high lights is ordinarily difficult to get, the double-strength solution should be used, the prints in this case being very slightly undertimed and printed in sunlight. For a weak negative from which it is desired to get better contrasts than it normally renders, print in the shade, overprint somewhat and develop with the stock or double-strength solution diluted with three parts of water. This gives more contrast, and a rather grayer tone than the normal developer, with, in some cases, a slight tendency to warmth. A badly overtimed print can sometimes be saved by using only a few drops of developing solution in a quantity of water sufficient to cover the print. The use of too weak a developing solution is apt, however, to cause mealiness or granularity in the print, due no doubt to the washing away of the platinum salts in the paper before the developing solution has time to reduce them. The use of diluted developer is, therefore, recommended only in cases of overtuned prints in which development is ordinarily quite rapidly effected.

Alkalinity of Developer Some English writers state that the acidity or alkalinity of the developing solution has its effect on the tone of the print, the effect of acidity being to give a very black

image strong in contrasts, while the effect of alkalinity is to give warmer tones. To obtain strong prints from weak negatives Jacoby recommends the use of a 20-per cent solution of oxalate of ammonium, five drops of which are added to each ounce of developer. Thomas, in the *Amateur Photographer*, states that a few drops of a solution of carbonate of potash added to a warm developer will add to the warmth of the tones. For the same purpose Beanland recommends the use of an alkaline developer heated to 100° Fahr., the warmth of the resulting tone depending upon the amount of alkali in the developer and the temperature at which it is used. I have tried these methods with the cold development paper made in this country, but without practical satisfaction. Nevertheless they are worthy of a trial.

As a corrective for overprinting, Glycerine nothing can equal the use of glycerine in the developer. In a number of instances in my own experience, where prints have through inadvertence been allowed to go so far as to actually print-out in the frame, they have been saved by developing with a tuft of cotton which had been soaked in a solution of equal parts of glycerine and developer, squeezed nearly dry, and then brushed very lightly over the face of the print. Glycerine is also used to great advantage in those cases where one portion of the print requires more development than others, such as too dense a sky in a landscape negative. In these uses the principle is the same but the method somewhat different from that described later under the head of "brush development." The methods above suggested are fully described in *THE PHOTO MINIA-TURE* No. 7, pages 341-344.

The Use of Mercury Bichloride of mercury is used in the developer with the cold-developer or black-tone paper for the purpose of adding warmth to the tone. Its use is frequently objected to on the ground of a lack of permanency in the result, and, more frequently, on the ground of irregularity of action. As to the first, Hübl pointed out some years ago that the brown image obtained by using mercury consisted essentially of platinum, and that such

image was therefore as permanent as the ordinary black platinum image. Certain it is that a great deal of our best exhibition work is done by this method, and many of the most advanced professional workers are using it almost exclusively. As to the second objection, that arises mainly because most workers pay no attention whatever to the several factors that go to bring about a given result, and then expect to get that result by the use of entirely different factors.

Controlling Factors The final tone of the mercury-developed platinum print depends upon a number of different factors. The rough papers yield much more pleasing results than the smooth. The depth to which printing is carried makes a great deal of difference in the result. The badly undertimed print will give a miserable, sickly looking, mustard-colored print. A slightly undertimed print will not be much better. The fully timed print properly developed and cleared, will give beautiful rich brown shadows and pleasing half-tones with clear high lights. Overprinting gives black shadows with warm brown half-tones, and clouded high lights in some cases. The character of the negative, whether thin or vigorous, also has its effect. With thin negatives the tones will be harmonious throughout; with strong negatives shadows will be black and the half-tones a warm brown, but the general effect is quite pleasing except in the case of negatives altogether too strong in contrasts. The temperature of the developer also has a marked effect. Under 100° Fahr. the prints are not apt to be pleasing in tone, from 130° to 140° Fahr. being the proper temperature for the developer. Beyond that there is very little difference in tone, but considerable difference in the amount of contrasts, a very hot developer tending to reduce contrasts.

The amount of mercury used in the developer is all-important. The best proportion for ordinary work is one part of a saturated solution of mercuric chloride to eight parts of normal developer. For special effects the proportion of mercury solution may be increased to one-third. Some workers advocate the use of a 1-to-25 solution of bichloride of mercury instead of a saturated

solution. As this salt is ordinarily soluble in sixteen parts of water, this means a half more in bulk should be used. When mercury is added the developer should be thoroughly mixed before using. The developer usually works better after one or two prints have been developed. In making tests to determine the effect of different temperatures and different proportions of mercury, it is simply a waste of time and good material to experiment with different prints from the same or different negatives. The only accurate tests are those made by cutting up a single print into a number of strips, and then comparing them after development. The slightest difference in printing will otherwise render conclusions absolutely unreliable.

Influence of Clearing Bath The clearing bath also has its effect on the tone of the mercury-developed print. The ordinary 1-to-60 clearing bath of muriatic (hydrochloric) acid bleaches the prints too energetically. It has been demonstrated that three washings of a few moments' each in a bath made up of 1 part of hydrochloric acid to 300 parts of water removes the last trace of iron from the paper, and that is all the clearing bath is for. Even a bath of this strength will bleach mercury-developed prints if they are left in too long. They should be hurried through the three clearing baths into the final washing water without more delay than necessary. Stieglitz has suggested that fully timed prints from thin negatives, which would ordinarily be very flat, gain in contrast in a marked degree when developed with a developer rather strong in mercury and afterwards placed in a clearing bath somewhat stronger than 1 to 60, the brownish tone entirely disappearing after some time.

Variations with Mercury Development Innumerable formulæ for modifications in the use of mercury in the developer have been suggested. In all of them the mercuric bichloride is the active agent, but the addition of other ingredients seems to make some slight difference in the final results. For obtaining sepia, chocolate and red chalk tones on the cold-development black paper, A. Peebles Smith (1897) recommends the following: Make up

stock solutions: *A*. Potassium oxalate, 4 ounces; water, 16 ounces. *B*. Cupric chloride, 124 grains; water, 8 ounces. *C*. Mercuric chloride, 1 ounce; water 16 ounces. *D*. Lead acetate, 32 grains; water, 4 ounces. The water in all cases should be distilled. Take first 3 ounces of *A* and 1 ounce of *B*; then add, with vigorous shaking or stirring, 1 ounce of *C*, and lastly $\frac{1}{4}$ ounce of *D*, heating the mixture until the precipitate is dissolved. The print should be carried to the normal depth in printing and developed with the developer at 175° to 185° Fahr. Warmer tones are obtainable by the use of a larger proportion of the mercury solution.

A very few drops of the mercury solution in the normal developer, cleared in the usual clearing bath, will be found to considerably increase the contrasts in all platinum prints without materially altering the tone. For the same purpose some workers advise overprinting from weak negatives and the use of a weak developer to which has been added a few drops of mercuric chloride solution.

Other salts than those of mercury have also been recommended for varying the color of the image normally obtained with the black-toned papers. It has been suggested that two grains of cupric chloride added to each ounce of cold saturated solution of neutral oxalate of potash, and used regardless of the precipitate which forms, will yield warm blacks with clear whites.

Potassium Phosphate The addition of potassium phosphate has long been employed to aid in obtaining warm tones with the ordinary black papers. The following are a few of the results which have been obtained in demonstrations: Potassium phosphate, $\frac{1}{2}$ ounce; potassium oxalate, $\frac{1}{2}$ ounce; water, 5 ounces, used with W. & C. AA paper at 70° Fahr.—result, warm black; used at 170° Fahr., a much warmer black; the same formula plus three grains of mercuric chloride, used hot, gives a brown-black; $\frac{1}{2}$ ounce potassium phosphate, 1 ounce potassium oxalate, 30 grains mercuric chloride, 5 ounces water, used with CC paper, the developer being heated, gives cold brown tones. These results, of course, depend largely upon the depth to which the printing has been carried.

Intensification of Prints So far we have confined our attention solely to the modifications possible in the actual making of the prints. We will now consider some of the modifications possible after the print has been made which needs further treatment before it can be considered as a finished production. To this class belong all those prints which have been failures from one cause or another, as well as those which have been purposely left in an unfinished or imperfect state for the purpose of after-toning. These modifications are all in their nature toning or intensification processes, depending upon the addition to the platinum image of other metals in their nature more or less permanent and unchangeable.

A slight degree of density can be added to a platinum print by bleaching as far as possible in a solution of mercuric chloride, 60 grains; potassium bromide, 60 grains; water, 5 ounces. Now wash the print thoroughly and blacken in a 10-per cent solution of sodium sulphite to which has been added a drop of sulphuric acid, after which again wash well and dry.

The metals most generally used in the intensification of platinum prints are platinum itself, silver, gold and uranium. A few good formulæ are given.

With Platinum The simplest and most generally used platinum intensifier is that of Hübl, the formula being given on page 350 of THE PHOTO-MINIATURE NO. 7. Beanland recommends a slight modification of this formula, as follows: I. Sodium formate, 48 grains; distilled water, 1 ounce. II. Platinum perchloride (platinic chloride), 10 grains; distilled water, 1 ounce. For use add 60 minims of each solution to 4 ounces of water and immerse the print after the regular clearing and washing, until the desired density is obtained. This intensifier simply adds to the density of the print without changing the color in any degree.

With Silver There are a number of formulæ in which nitrate of silver is used as the intensifying agent, but it is unnecessary to give all of them. Some workers believe that the application of gallic acid is the only sure method with

the use of silver. A formula based on this supposition is as follows: Immediately before using, mix $1\frac{3}{4}$ ounces of a cold saturated solution of gallic acid; $\frac{1}{2}$ dram of a 10-per cent nitrate of silver solution; water, $1\frac{3}{4}$ ounces; glacial acetic acid, 10 drops. Thoroughly wet the platinum print and place it in this solution until the desired depth is reached, after which give the print several changes of water slightly acidulated with acetic acid. By transmitted light the print should now show a reddish tinge due to the deposit of silver. This is converted into metallic platinum by allowing the print to blacken in the following: Potassium chloroplatinite, 15 grains; phosphoric acid, $\frac{1}{2}$ ounce; water, 25 ounces. The print is then washed for half an hour and dried, when it will be found to have undergone considerable intensification. As this treatment tends to increase the contrasts in the print to a great degree, it should be used only with prints which have full detail but are lacking in vigor. Pyro can be used in the foregoing formula instead of gallic acid, but it is liable to act too energetically, irregularly, and to give a coarse-grained deposit of silver. Hydroquinone may be used as follows: I. Hydroquinone, 2 grains; citric acid, 20 grains; water, 1 ounce. II. Nitrate of silver, 48 grains; water, 1 ounce. Add 1 ounce of I to 10 drops of II. Flow the solution over the print until sufficiently intensified, then wash and fix in a weak hypo bath. Roland Bryant some years ago recommended the following formula: 5 to 10 drops of glacial acetic acid, about 1 grain of pyro, about 2 drops of a silver nitrate solution (60 grains to the ounce) to each ounce of water required in making the volume of solution desired. The prints are first wet and then the pyro and silver added in small quantities until action begins. The action of the intensifier is dependent upon the temperature and the balance between the acid and the pyro, but when once started is apt to go on so quickly as to require some care in avoiding fog. The color and form of the deposit will vary with the rapidity with which it is formed, the color of the original print, and very materially with the depth of the print. On the black paper, plainly developed, the intensified image is black, sometimes quite a blue-



From a plum-colored platinum print
James H. McCorkle



From a dark brown platinum print
James H. McCorkle

black. If it has a tendency towards red this can be removed by warming while still damp, when it will at once turn a cold black. With a mercury-developed black-toned print, the silver deposited is a purple-brown. The sepia paper intensifies well with this solution, giving a series of browns with a tendency towards yellow. In intensifying platinum prints by these formulæ the work should be done by artificial light, as otherwise there is a tendency towards fog. Warren recommends the following for the same purpose: Ferrous sulphate, 2 parts; acetic acid, 15 parts; water, 200 parts; silver nitrate (1:100 solution), 1 part.

The only method of gold toning of
 With Gold platinotypes in use at present is that given by Dollond years ago, and, as full directions for its successful use were given in THE PHOTO MINIATURE, No. 7, they need not be repeated here. I would suggest, however, that a weaker solution of gold than that originally recommended can be used if preferred, although the operation will, necessarily, proceed more slowly. If the method proves unduly slow, try raising the temperature to not over 70° Fahr. by holding the print at a safe distance over a lamp or gas-jet. This method of toning with gold yields blue-black prints of a very pleasing quality, the deposit being regular and fine in grain.

Toning Of all the methods available for vary-
 with Uranium ing the colors of platinum prints, however, toning with uranium is at once the simplest and most popular. It also yields the largest variety of tones or colors. Uranium toning is applicable to almost all grades and brands of platinum paper, whether hot or cold bath, black or sepia papers, development papers or the later print-out platinum papers which are developed by immersing the exposed print in hot water. True, the results vary according to the variety of paper used, but they are almost invariably pleasing. When otherwise, we can easily bring the toned print back to its original color. The colors obtainable with uranium run through the warm blacks, browns, sepias, chocolate, plum, red-browns, reds, blue-green, blues, purple and purple-black. The colors are

not as pure as those obtained with carbon tissues, but they are altogether pleasing and vastly simpler to obtain. The chemical action of the uranium toning bath has been explained as follows: "If a uranium salt is mixed with ferricyanide of potassium, a solution is obtained which is quite stable in the dark, and which is unaffected by the platinum image. If to this solution, however, a reducing substance be added, which has the power of converting the ferricyanide into a ferrocyanide of potash, such as, for instance, sulphuric acid, ammonium sulphocyanide, grape-sugar, thiosinamine, etc., the liquid becomes cloudy and a soft brownish deposit of ferrocyanide of uranium is obtained. Such a solution acts upon a platinum image exactly as a silver intensifier acts, and deposits a brown-red precipitate. In this way it modifies the cold black tone and at the same time acts as an intensifier. As the deep shadows increase in depth more than the half-tones, the brilliancy of the print is considerably increased." In this brief explanation we have the basis of all the changes resulting in the toning of platinum prints with uranium.

**McCorkle's
Methods
and Formulæ** The toning of platinum prints with uranium is by no means new, but it is only within the last few years that the process has reached that degree of certainty in result which makes it desirable. Mr. James H. McCorkle has achieved remarkable results in this branch of work. In the prints we have seen there are not only the colors mentioned in the preceding paragraph, but others in two colors, offering most desirable effects. Further, if the colors obtained are not pleasing, the prints can be easily restored to the original black and white or sepia. I gladly, therefore, make room here for a full description of Mr. McCorkle's successful formulæ and working methods, giving them, as far as possible, in his own words.

Dishes The dishes or trays used in uranium toning are of considerable importance. I strongly advise the use of deep porcelain kitchen dishes or deep trays for the work. The uranium bath becomes very much discolored in use, and throws down a heavy deposit which is difficult to re-

move from trays of the ordinary sort, but which can be removed most readily from a porcelain dish with a tuft of cotton. Deep trays also permit of a generous bulk of solution, which obviates many minor difficulties in handling prints in quantities. Three or four dishes will be required in addition to the regular outfit of developing and clearing baths. In using uranium it should be remembered that this salt stains everything it touches. Care and cleanliness in manipulation are therefore essential to successful results.

The color desired in the finished print
Printing should be determined, if possible, before printing, as the beauty of the picture depends upon the depth of the print rather than upon the subsequent toning. It is impossible to get the best results unless the original print has been correctly printed. For red tones the original print should not be deeply printed, but only sufficiently deep to show the details of the subject. The toning will bring out additional detail, and the prints dry darker than they appear when wet. For blue tones the original print should be quite dark, so that all the detail is fully shown. In this way only is it possible to secure the velvety ultramarine blue shadows so desirable in this class of prints. If not dark enough the blue effects lack vigor and have an unpleasant, washed-out appearance. For the combined blue and brown prints the original print should be midway between a light and a dark print. In fact I make use of prints too light for blue tones and too dark for red tones in this way.

Strange though it may appear one
The Toning Formula formula suffices for all the colors, blue and red with all the intermediate shades, and blue and brown combined, the precise color being determined by the time of immersion in the bath. Prepare the following solutions: I. Uranium nitrate, 10 grains; glacial acetic acid, 1 dram; water, 5 ounces. II. Ferricyanide of potash, 10 grains; glacial acetic acid, 1 dram; water, 5 ounces. Mix just before using, then add a piece of sulphite of soda, about the size of a small pea. Be sure the soda is thoroughly dissolved before placing any prints in the bath, or the prints will

show dark spots due to the presence of undissolved soda in the bath.

Some workers advocate keeping the uranium and ferricyanide in stock solutions. I have tried this, but it has not proved as satisfactory as the use of solutions freshly prepared as needed.*

Duration of Bath When developing (or toning) red prints, ten ounces of solution will tone six or eight prints, $6\frac{1}{2} \times 8\frac{1}{2}$ inches, after which it loses strength, and a precipitate is thrown down which stains the prints. When toning blue prints ten ounces of solution will tone eight or ten prints, $6\frac{1}{2} \times 8\frac{1}{2}$ inches, after which it is liable to stain the whites a greenish color. Do not be too economical in the use of toning solution. One good print is worth more than the cost of a new bath. Keep two glasses at hand containing solutions I and II in reserve so that a fresh toning bath can be quickly made up if needed.

Developing for Red Prints Take the printed picture (light) and develop as usual in the oxalate as for an ordinary black and white print. Do not overdevelop as this unfits it for after-toning and will result in a muddy, dark print. After development, clear as usual in five acid baths of hydrochloric acid, 1 ounce; water, 60 ounces. Keep the prints well separated and constantly moving while in the clearing bath. On this will depend the brilliancy of the finished prints and freedom from spots and stains. Carelessness here is fatal to success. After they are cleared wash the prints with special care and spread them to dry on clean cheesecloth or muslin in a current of air.

When all the prints are thoroughly dry we can begin to tone them. Mix solutions I and II as directed. Place the prints in the combined bath one by one and face down. Quickly turn them over and, with a tuft

*NOTE: While ferricyanide of potash does not "keep" for any length of time in solution, yet there can be no objection to making up a stock solution of the uranium nitrate. It is certainly more convenient to use it in that form than to weigh out a small quantity of the crystal each time it is used. If an ounce of uranium nitrate is made up in solution with five and a half ounces of water, and kept in a brown glass-stoppered bottle it will keep perfectly for a year or longer. When so dissolved, one dram of the stock solution will contain approximately ten grains of uranium nitrate and can therefore be used in Mr. McCorkle's formula in place of the ten grains in crystals.

of cotton, go over them back and front, until a sufficient number are immersed, according to the volume of the solution. Now begin to draw the bottom print out and place it on top, repeating this operation until all the prints have changed position, or until they reach the desired color. When this is reached remove the prints quickly, wash them back and front with a tuft of cotton and clear water to remove the deposit of uranium, and place them in a separate clearing bath composed of hydrochloric acid, $\frac{1}{2}$ ounce; water, 60 ounces (half the usual strength). Give them two changes in this clearing solution, wash thoroughly in clear water and dry as usual.

Mark the cheese-cloth used for the drying of these prints, and use separate strips of drying cloth for each different set of colors. Do not be uneasy if a few bright green spots appear. These can easily be touched out in the print. If care has been taken the resulting prints will have a rich red color with pure white in the high lights and margins.

In many ways the blue tones are more easily secured than the reds, but more care is needed to obtain uniformity. The original prints must be fairly deep in tone, a little darker than one would desire in a black-and-white print. Mix the uranium bath, as already directed, before development, and place your trays in the following order. (1) The regular oxalate developing solution; (2) the ordinary acid clearing bath (1 to 60); (3) the uranium bath made up as directed for red tones; (4) a clearing bath made up of hydrochloric acid $\frac{1}{2}$ ounce; water, 120 ounces.

Take a fully exposed print and develop it in the usual way; next place it in the ordinary clearing bath for not more than 10 seconds; then place it in the uranium bath, going over the back and front as already instructed. The print will slowly turn in this bath to a beautiful blue color, when it may be removed to the weak clearing bath and finally washed as usual. Wash the hands thoroughly, and repeat these operations with each print desired in blue tones. If the toning bath becomes discolored replace it with a fresh solution,

placing the prints in clear water while the change is made. Should any of the prints prove unsatisfactory, place them in a saturated solution of sodium bicarbonate, which will restore it to the original black and white. Wash thoroughly and dry. Prints so restored can be toned red if desired and in this way saved. Do not wash red and blue prints in the same water, or dry them on the same strip of cheese-cloth, as the red prints will invariably suffer if this is done.*

The character of all uranium-toned Variations prints will be found to vary with the make of paper used, apart from other differences. Thus the blues obtained with Willis & Clements' and American Platinum papers differ from those obtained with Angelo paper. I prefer the latter for blue tones, and Willis & Clements' paper for red tones. My experiments have been confined to the Willis & Clements, Angelo, Bradley, and American Platinum papers, and without any idea of disparagement I prefer them in the order given, speaking simply of their behavior in the uranium bath. A little experience will show the possibilities of each paper, after which the reader can follow his own taste in the choice of papers for his purposes. The proper choice of paper is as essential to success as any other part of the process.

I might also mention that muriatic acid can be substituted for the glacial acetic acid mentioned in the toning formula. Half the quantity indicated for acetic acid will suffice when muriatic acid is used.

*NOTE: This method of obtaining blue tones on platinum paper is vastly superior in beauty of results, certainty and regularity, to the old way of immersing a brown or red toned print after clearing and washing in a solution of iron. It may not entirely supplant the old method, as there are many cases where the blue tone is determined upon after the print is made, but where the blue tone is primarily designed, this method should be used in preference. As is well known, a combination of any of the salts of iron and ferricyanide of potash throws down a blue or blue-green deposit on photographic papers and plates regardless of the presence or absence of uranium. In the old method the print having been immersed in a solution containing potassium ferricyanide and subsequently immersed without washing in an iron solution, the deposit being thrown down as a consequence. In Mr. McCorkle's method, the iron in the platinum paper is utilized, and combines with the potassium ferricyanide in the toning bath. The purpose of the clearing bath being to eliminate the iron from the paper, it follows that the longer the clearing the less of the blue there will be in the finished print. These suggestions are given for the benefit of those who care to experiment further along the same lines.

Blue-and-Brown Tones The browns referred to are more truly described as a deep olive-green than a pure brown. The process of toning is the same as for the blues, except that the print after developing is left for thirty seconds or more in the full-strength clearing bath. If, after placing the print in the uranium bath from the clearing bath, the shadows do not come up to the desired brown color, rinse the print in water and put it back into the full-strength clearing bath for another half-minute, afterwards return into the uranium bath. The olive shade depends entirely upon the amount of clearing the print has had before being placed in the toning bath. The combination of brown and blue can also be obtained by taking a blue-toned print which has been cleared and washed, and placed it for a few moments in a fresh uranium toning bath prepared in the usual manner.

Chocolate Tones These are obtained by using the regular red toning bath after a number of prints have been toned in it, and after it has become rather thick and somewhat dark in appearance. A new bath is not suitable.

Cleanliness In no branch of photographic manipulation is absolute care and cleanliness more necessary than in uranium toning. Fingers which have been in the uranium bath should be well washed before handling an undeveloped print, and should be even more thoroughly washed after making the blue-toned prints and before taking up the red or brown prints. The trays which have been used for making blue-toned prints should be thoroughly cleaned before using the ordinary red-tone bath in them, and in fact every possible precaution used to avoid any trace of the blue tones on the red and brown prints.

Instability of Uranium Baths It will sometimes be found that the uranium bath will get cloudy and throw down a heavy precipitate. In this event the prints should be immediately removed and placed in fresh water while a new bath is being made up. To meet this emergency it is always well to keep at hand two glasses containing uranium and ferricyanide solutions ready for mixing.

Failures, of course, will result at times.

Failures When this is the case the prints can be brought back to their original color by washing them in a saturated solution of carbonate of soda or by immersing in the ordinary oxalate developer which is left over after the day's work is done. After a thorough washing they can be again toned in the red-tone bath, but of course the blue tones cannot then be obtained by this method.

Nearly all workers with uranium are
Spots at times troubled by the presence of small bright green spots. There is no remedy for them, except spotting with a brush and spotting-medium of some kind prepared to match the print. They can to a large extent be avoided by thorough clearing and washing as directed.

The washing of uranium-toned prints
Washing should be thorough without being too prolonged. It will be found that prints will be much brighter and more brilliant in every way if before the final washing they are given a thorough rinsing in very hot water.*

The precipitate formed by the uranium
Cleaning toning bath is quite difficult to remove
Trays from the trays and hands by the ordinary methods of washing, but is dissolved instantly by the application of a strong solution of carbonate of soda, after which the trays should be thoroughly washed in clean water. Old oxalate developer can also be used with the same effect if more convenient than the soda.

Mr. McCorkle, in the foregoing, has
Points in referred more particularly to the black-
Manipulation tone paper developed in the ordinary developer. It will be found that if the print be developed with the addition of mercury to the oxalate developer, the action of the toning bath will be much more rapid, and other things being equal, the reds will be much brighter and more genuinely red, although

*NOTE: The fading out of uranium-toned prints in the washing water is frequently due to the presence of alkaline substances therein, and can be avoided to a great extent by clearing all prints, after toning, in an acid bath as suggested by Mr. McCorkle, or by putting a few drops of acetic or other acid in the washing water.



LOOKING ACROSS NEW YORK BAY

From a light blue platinum print, by James H. McCorkle



From a greenish blue and brown platinum print
James H. McCorkle

some of Mr. McCorkle's reds that we have seen would be very difficult to improve upon. An undertimed print developed with mercury in the developer will tone up to quite a decided red in the toning bath, almost red chalk in some cases. In referring to reds in his text, Mr. McCorkle includes all the various shades of brown which naturally result from the length of time toning is allowed to continue. A black-tone print immersed for a few moments only will show a slight warmth in the shadows and half-tones, this giving way to sepia, brown and red in succession. The rough-surface papers will be found to tone much more rapidly than the smooth, and the tones will be more regular and satisfactory in every respect.

Sulphite of soda is much more rapid in its action than sulphocyanide of ammonia, and hence for use with the black-tone papers is preferable. For use with mercury-developed prints the sulphocyanide of ammonia will be found preferable, as the bath is better under control. Where its use is preferred, substitute 40 grains of sulphocyanide for the small crystal of sodium sulphite recommended by Mr. McCorkle in his formula. In a great many of the formulæ given in books for use with the mercury-developed paper, both sulphite of soda and ammonium sulphocyanide are omitted entirely.

The amount of potassium ferricyanide likewise has its effect upon the rapidity of the bath. Some of the formulæ in the books call for only one-fifth or one-sixth as much of the ferricyanide of potash as of the uranium nitrate. These formulæ are usually recommended for use with the mercury-developed paper with which, as has been stated, the action is much more rapid. Mr. McCorkle's method of obtaining blue tones can be used with prints which have been developed with mercury in the developer, the process being almost identical.

**Blue Tones
by the Old
Process** To obtain blue tones by the old process, immerse a print which has been toned brown or red, without previous washing, in a solution of perchloride of iron in water, about 1 grain of iron to the ounce of water. If this works too rapidly, it

will be well to dilute it even further. The print turns a blue-green and then a deep blue. If then immersed in a strong solution of muriatic acid in water it will turn a brighter blue, and even a brighter blue if flowed immediately with a solution of potassium ferricyanide in water. In the first instance the change from green to blue is very rapid, and in order to preserve the former the print should be removed from the bath a moment before the desired tone is reached and plunged right into a tray of water slightly acidulated. It should then be washed for a few moments only, swabbing lightly with a tuft of cotton to remove the excess of deposit. If the washing is prolonged the greenish tone will change to a decided blue. The green tones are difficult to get and preserve, and depend somewhat upon the depth of the print. The strength of the iron bath can frequently be varied to advantage, the strength given being merely indicative.

Very good greens can be obtained by taking a pretty well-worked uranium bath and adding to it an equal quantity of the iron solution. A print which has been partially toned in the usual bath for the brown and red tones is then immersed in this combined bath, and if taken out at the right moment will possess a decided greenish tone. This method is very useful for sea-views. The iron bath intensifies very much more than the red bath, but when a print proves too dark it can be brought back to the starting point by immersion in a strong solution of soda and started over again after a thorough washing in acidulated water. It will sometimes be found that the soda solution will bleach the print badly. In this event it will be found to blacken if placed for a moment or two in the regular platinotype developer. This necessity is avoided if the bleaching be done in a used developer.

Brighter greens of a rather peculiar hue can be obtained by immersing a finished mercury-developed print in the toning bath in which blue or blue-brown prints have been made according to the McCorkle method. The process will be a little slow, but the results are interesting.

In order to reduce the matter of uranium toning to some degree of certainty, the writer some years ago adopted a plan of making a series of picture charts, i. e., a series of prints printed and developed to different degrees and cut in four parts. One part of a print was kept as it came from the developer, and after the usual clearing and washing. Another quarter was toned for a given length of time in the uranium bath, another a little longer, and the last still longer. The four were then mounted on one card. This being done with a great variety of prints, it became comparatively easy to get a desired color or tone by first finding it on one of the charts and then carrying the print to the depth of the untuned section, afterward toning it in the regulation bath to the required depth. When worked along such lines the uranium process will be found to be as certain in results as any other photographic process. The uncertainty complained of nearly always results from the fact that workers never keep any two conditions or factors constant, and then quarrel with the process because it fails to give constant results. As well quarrel with arithmetic because 6 multiplied by 4 fails to make 20 when 5 by 4 does.

Local Brush Development The most radical modifications of which the platinotype process is susceptible are those produced by what is generally known as brush development. This is an advanced form of the brush development which has already been referred to. It might more properly be called the local development of platinotype. By this method it is possible not only to eliminate from the print a great deal of detail and many objects which should properly be eliminated, but it is also possible for the artist to add to the print lines and masses which are not in the negative at all, and thereby overcome in a great degree the limitations of photography in this respect.

The principle upon which this method depends lies in the fact that light in itself and acting alone has no effect on the metallic platinum contained in the bath with which the paper is sensitized, and that the pro-

visional iron image, which is what we see in the printed but not developed platinum print, washes away entirely when placed in acidulated water. Hence it follows that no matter how deeply a portion of a print may appear to be printed, unless a developing solution is applied to that portion, it will wash out entirely as soon as placed in the ordinary clearing solution. The process in some of its applications is also dependent upon the fact that glycerine acts as a physical retarder when used with the oxalate developer and enables us to hold back one part of the image while developing up some other portion.

In its simplest form, the brush development of platinotype consists in applying the ordinary developer where wanted on the platinum print, and as soon as development is completed immersing the print in the ordinary clearing solution. This method can be used quite successfully in the case of portraits taken against white backgrounds where the latter print out very slightly. But the tendency is to leave sharp lines, and it is therefore better, even in such cases as this, to add an equal quantity of glycerine to the developer, applying the solution with a brush as before, first, however, to the portions which require full development and gradually working outward into those portions requiring less depth, stopping as soon as the former are fully developed.

This method can be used quite successfully in portrait work where the idea is to give the print a sketchy effect with the minimum of labor. It is useful in the case of portraits taken against dark as well as light backgrounds, also in portraits taken outofdoors, where it is desired to leave in the print only a portion or an outline of surrounding objects. A very little practice will enable the worker to turn out quite a large proportion of successful prints by this method, and it has the advantage of being much less tedious than the regular method which will be next set forth. In the case of prints not larger than 5 x 7, one brush will ordinarily do for this work. It should be a soft sable or camel's-hair brush, not larger than a small lead-pencil.

**The
Equipment**

In the regular method of local brush development the outfit required is somewhat more extensive. If the worker is going to make only black-and-white prints, eschewing the mercury tones until he becomes more proficient, he will need half a dozen brushes varying in size from the two-inch camel's-hair brush such as is used in dusting off plates, to one of the small brushes used for spotting prints. It will also be necessary to have three or four small cups to hold the developer and glycerine. The best thing for this purpose is the small glass sponge-cup which can be had from any stationer at ten cents. A complete outfit for the purpose can be had from the Oberg Camera Co., New York, at a moderate cost. A goodly store of blotters should also be purchased, and not less than a pound of glycerine to start with. The best blotters are those known as Royal or Robosal and made especially for photographic purposes. They can be had at any stock-house. It is a mistake in this process to try to economize on blotters and glycerine.

**Working
the Method**

The process is very simple to describe, but will not be found particularly simple to work even after a number of failures. The first dozen prints will be rank failures. That must be expected.

It is ordinarily advised to carry the printing rather far, but this is in most cases not at all necessary. Overprinting adds greatly to the difficulties of local development, and should be avoided whenever possible. When the print made in the normal way is too light in any part—say the drapery in portraiture or the sky in landscape work—then printing should be carried far enough to give those portions of the print their proper depth. In such a case the holding back of the other portions is a necessary feature of the work and we must make the best of it. But where in the normally printed and developed picture the lightest portions are as dark as they are wanted in the locally developed print, it is entirely unnecessary to carry the print beyond the usual stage.

Assuming that our print is made and everything at hand, we first put some pure glycerine in one of the

little cups, and in it place a brush of medium size, say a little larger than a lead-pencil. In cup No. 2 we put an ounce of the normal oxalate developer, an ounce of glycerine and two ounces of water, or if our cup is too small for that we use the three ingredients in the proportions given. This cup we mentally label weak developer. In cup No. 3 put an ounce of developer and an ounce of glycerine. In cup No. 4, an ounce or two of the normal developer without any glycerine. The other brushes are placed within easy reach. We next cut up our blotters into a number of pieces ranging in size from that of the print or a little larger to little pieces only an inch or two square, and it is well always to have a good supply on hand.

Everything being ready, we next put a few drams of pure glycerine on a sheet of heavy glass somewhat larger than the print, and spread it thoroughly with our two-inch brush. Place the print on this face up and it will be found with a little persuasion to stay there and remain flat. Then pour some glycerine out of the bottle right on the face of the print and spread it thoroughly with the two-inch brush. Let this soak into the print a minute or two and then blot it off with one of the larger pieces of blotter, rubbing it down well and finally using another piece if necessary. Now coat the print with glycerine again and after allowing it to stand for a moment blot off the glycerine on the part which is to receive the developer first, preferably the part requiring the most development, leaving a good coating of glycerine on the parts of the print to be entirely eliminated. If we have a proof from our negative it will come in well at this stage. Having blotted off the glycerine from the parts on which we wish to work, we now dip one of our brushes in the cup containing the weak developer, and drawing the brush over the edge of the cup or between the fingers to remove the surplus developer, apply the brush to the parts of the print requiring development. Development will be rather slow, and the slower it is kept the better. After getting the image pretty well started with the weak developer, the parts requiring full development should be brought up gradually by applying the solution from

cup No. 3 with the brush as needed, using the normal developer from cup No. 4 only where the maximum development is required. If at any time any portion of the print has come up fully enough before the work on other portions of the print is finished, a bit of blotter should be applied to take up all the developer from the print at that point and a liberal coating of glycerine applied with a brush from cup No. 1. This will be found to practically stop development at that point and will enable the worker to go on with the development of other portions of the print. The great secret of success in this work is to take your time and not to apply the developer too liberally. The brushes should have on them only enough developer to barely moisten the part of the print to which they are applied. The developer should not be flowed on with the brush except in very rare instances. While more detailed instructions could be given for doing this class of work, enough has been said to show the reader that it is after all wholly a matter of individual skill in using the brushes, and of artistic knowledge in knowing where to use them and where not to use them.

Varying the Tones Warmer tones can be obtained quite readily by using mercury in the cups containing the developer, but as it is difficult to apply very warm developer satisfactorily in this manner, the very best mercury tones are not to be expected. Nevertheless the use of mercury adds a little variety. A very material advantage in using mercury is that where mistakes have been made in using the brush they can be remedied to a very great extent by applying a strong solution of muriatic acid in water, equal parts of each, to the lighter portions of the mercury-developed image, and it will bleach them out entirely. As this treatment is not good for the paper itself it should be used sparingly.

Other Modifications Still further modifications can be obtained by the use of the normal developer for the main portions of the print, the mercury developer being used where it is desired to introduce flesh-tones in portrait or figure work. Some very beautiful work in this line has recently been done

by American workers of note, and it furnishes an interesting field for further experiment.*

Two things are to be particularly noted in introducing the mercury modifications. First, the same brushes cannot be used for both black and mercury tones. If they are, ugly stains will result. No amount of washing will entirely remove the mercury from the brushes, hence an extra set must be kept for such use. A bit of string wound around the end of the mercury brushes will sufficiently well designate them and is a precaution easy to take. In the second place, a print developed up either wholly or partly with mercury must always be cleared in the weak clearing bath heretofore given for use with prints made by the mercury method. If placed in a clearing bath of normal strength, 1 to 60, the mercury-developed portions will be found to bleach out badly leaving the black portions as they came from the developer, thus ruining the print.

Clearing the Prints

In placing glycerine-developed prints in the clearing bath, they should be gone over front and black with a tuft of cotton or soft brush to remove the glycerine in order that the clearing bath may reach all portions of the image and stop further development.

Vignettes in Color

Still further modifications of prints made by the above-described method may be made by using the uranium toning bath with the finished prints. If mercury has been used in the development, those portions will come up most rapidly, the half-tones of the black image following, and the deeper black shadows last. Very pleasing little portrait sketches can be made by developing up a normally or slightly undertimed print with the mercury developer by means of a brush and then toning in a uranium bath rather strong in ferricyanide of potash. The tones will vary from a reddish brown to a genuine red chalk, depending upon the character of the print and paper.

It might be added that brush-developed prints are

*NOTE: Facsimile reproductions of some of the best examples by this method may be seen in "The Camera Notes Improved Glycerine Process for the Development of Platinotypes," New York, 1899,

nearly always more effective on the rougher papers, especially where sketchily done. But the field is such a broad one and so thoroughly open to the individual worker that it would be idle to undertake to go further into its many possibilities.

One of the most recent modifications in the use of platinotype paper is that introduced by Herbert Silberer, of Vienna, in which he takes a finished platinotype print, coats it with the ordinary gum-bichromate pigment the color of of the original print, and makes a second printing on this from the original negative, first accurately registering the paper on the negative in the printing frame. The gum print is then developed locally by means of brushes, the method when properly handled resulting finally in a print having those desirable characteristics peculiar to the gum process, but preserving the delicate half-tones and detail in the higher lights which are usually lost in that process. The method is useful in the case of harsh negatives which yield perfect results in neither platinotype nor gum.

Very pleasing transparencies can be made from platinum prints. Either the black, sepia or uranium-toned prints can be used. These transparencies can be used as window ornaments, for the making of fire-screens, lamp-shades, or in any of the numerous ways in which transparencies on glass by other processes can be used. A print which is too dark for ordinary purposes can be made into a very acceptable transparency if waxed in the manner described below. Prints on the thinner papers, such as Willis & Clements' AA, if printed to the ordinary depth can be used as window transparencies without waxing if placed between two sheets of glass, the back being either ground-glass or colored glass of any tint that may harmonize with the subject. They are then bound together in the usual way. Tissue papers of various tints, sometimes in combination, can be used in place of the colored glass if preferred. Unique and pleasing effects can also be obtained by roughly daubing crude coloring on the back of the print (green for trees, blue for sky, pink for faces, etc.), the combination when

backed with ground glass being quite translucent enough for all reasonable desires.

Waxing the Prints

There are a number of ways of increasing the transparency of prints when desired. A thoroughly satisfactory one is as follows: Place the print face down on a clean sheet of paper and apply vaseline with a tuft of cotton. Rub the vaseline in thoroughly and evenly, then place face down between two blotters and iron well with a hot flat-iron, substituting fresh blotters if necessary. Five or six drops of the following solution on the back of a 10 x 12 print will spread over the entire surface if quickly rubbed with a tuft of cotton or a bit of flannel: Benzole, 1 oz.; yellow beeswax, shaved, 2 drams; shake well and when nearly dissolved add ether, 1 oz.; alcohol (95 per cent.), 1 oz. Or if preferred, the ordinary waxing solution sold for use with ferrotype plates can be used in place of this last after the vaseline has been applied as directed.

Restoring Prints

It frequently happens that platinum prints take on themselves a yellowish tinge with age. Whatever may be the cause it is a trouble which can be quite easily remedied. Several methods have been suggested. Frank Wonderly (1897) recommends the application of tartrate of ammonia solution made by adding sufficient ammonia to a 5-per cent solution of tartaric acid until there is just a slight excess of ammonia perceptible by the decided smell of ammonia. Two other methods are referred to on page 351 of THE PHOTO-MINIATURE, No. 7.

To clean dirty platinum prints it is recommended to make a fairly stiff paste of flour and cold water of about the consistency of cream. Add to this a little common alum, about half a teaspoonful to a teacupful of flour. Rub all together with a spoon into as smooth a paste as possible. Apply with a soft brush all over the print and then wash off the paste under the tap. The paste will take with it all the dirt.

Sometimes in printing from negatives strong in contrasts the shadows will show a bronzed appearance. W. Thomas, in the *Amateur Photographer*, recommends the following treatment: Brush over the solarized parts

a wash of wax-water megilp, a bottle of which may be obtained from most dealers in artists' supplies. The dingy, rusty color will instantly depart and the shadows lose their bronzed appearance. When the image has sunken into the paper a weak solution of the megilp should be applied. Wash it in and let it soak well in, then dab it off with a clean cloth or blot it off with clean, hard blotting paper to prevent the shiny appearance.

To get rid of the dull appearance characteristic of some platinotype prints, A. Lainer recommends the following: A solution is prepared of gelatine, 125 grains; water, 10 ounces; powdered alum, 125 grains. The gelatine is dissolved in the usual manner in the water and the mixture gradually heated up to the boiling point. After removing the solution from the fire the alum is added and dissolved by stirring. Before use, mix the above solution with from one to two times its bulk of water. The mixture is kept warm in the water bath, and the platinotype prints are immersed in it for some minutes. They are then placed for a short time in a dish with cold water and then dried in the usual manner. Prints treated in this way are much more brilliant than those finished in the usual manner.

Enlarging on Platinum Paper Messrs. Abney and Clark in their book on *Platinotype* state that it is perfectly feasible to make direct enlargements on platinotype by either sunlight or arc-light, in either event by the aid of condensers. They state that with an arc-light of about 1,100 candle-power a rather thinnish negative can be enlarged to twice its linear dimensions in from 15 to 25 minutes. The apparatus described by them is practically the same as that described in THE PHOTO MINIATURE No. 16: *Bromide Printing and Enlarging*. I have made several experiments along this line, but find the time required very much longer than that stated, although I tried it with very thin negatives and with a light of the same candle-power. The time required to get a barely perceptible image was just one hour. With daylight and the ordinary enlarging apparatus, enlarging on platinum paper is entirely impracticable. By the use of a mir-

ror to throw the solar rays on the condenser, enlargements, it is said, can be obtained in ten minutes.

Much more care and good taste must be exercised in mounting toned platinum prints than is exercised in the case of the ordinary black prints. Where the aim is to make an artistic print alone, the less mounting the better. In such a case nothing should be done in the way of mounting which will detract in the least from the interest in the print or which will attract an undue amount of attention to the mount. There the whole effort should be to get a mount which will be in perfect harmony with the print and not draw attention to itself. To do this in the case of toned prints is sometimes difficult. One or two general rules can be laid down. Except in rare and carefully considered instances, the tone of the mount should always harmonize with one of the predominant tones in the print. In the case of a mercury-developed print, for instance, we have two main tones, the warm black of the shadows and the delicate brown of the half-tones. If we match either of these with our mount we are not likely to violate good taste. Even in this, however, there is a preference. If we wish to give full value to the high lights in our picture, we will mount it on a card matching the darkest tones of the print. If, however, we wish to overcome the contrasts and give greater value to the shadows, we should then mount the print on a mount matching some of the lighter tones. These rules are only starting points in cultivating our taste in matters of this kind, but they are safe ones to follow where the worker is at all in doubt.

All prints, however, do not pretend to be artistic in the higher sense, and the effort should then be made to make them as attractive as possible by the exercise of good taste in mounting. In cases such as this, mounts in contrasting tones can frequently be used to advantage. One, two or even three mounts can be used. When several mounts are used, care should be taken that the margins are not disproportionate. With small prints the margins should be seldom more than one-eighth of an inch. These mounts should be of comparatively thin

paper. The papers offered by the Niagara Paper Mills, of Lockport, New York, are especially suitable for mounting prints by this method. *These papers come in various shades, textures and thicknesses. The cover-papers usually comes in full sheets 20 x 26, and are sold by the pound, averaging in cost about two cents per sheet. The writer's plan for use with 4 x 5 and 5 x 7 negatives is to select a few sheets each of a dozen or two kinds of paper most likely to be useful and have it cut in such a way as to give two 11 x 14 pieces per sheet, the waste being used for double mounting. The 11 x 14 pieces are then mounted on 11 x 14 plain white cards. It is simply astonishing how much can be added to the attractiveness of a portfolio of very ordinary photographs with the great variety of mounts attainable by using these cover-papers in the manner suggested. Many useful hints and suggestions on this subject are mentioned in THE PHOTO-MINIATURE No. 20: *Trimming, Mounting and Framing*.

**Making
Platinum
Papers** An endless variety of special effects in textures and surface, as apart from modifications in color or tone, may be obtained by preparing one's own platinum paper. This is being done by an increasing number of enthusiasts, not from any dissatisfaction with the commercial papers, but simply as a practical means of obtaining platinum images on any kind of paper they may care to use. The advantages are obvious. The whole range of special papers made here or abroad are at once made available for the satisfying of our desires.

Some months ago I received from Miss Katharine S. Stanbery, Zanesville, Ohio, two or three exquisite platinum prints which aroused my curiosity by their quality. One of these, entitled "Lady Glenmire" was reproduced, approximately in facsimile, in the February number of THE PHOTO-MINIATURE. In answer to my request for particulars, Miss Stanbery generously gave me her method of working, which I will give here, as far as may be, in her words.

It is only a few months since I began to prepare my

*Obtainable in London from Henry Lindenmeyr & Sons, Arthur St., London Bridge.

own platinum papers, and I used the only formula available, viz., the Pizzighelli-Hübl process, to be found on page 379 et seq. of Woodbury's *Encyclopedic Dictionary of Photography*. There were a few other methods quoted in the same article, but this seemed to me the simplest. Since using it I have read of many new methods, but I was so well satisfied that I have not given the later methods trial.

Pizzighelli
and Hübl's
Process

The process, extracted from Pizzighelli and Hübl's *Platinotype*, is as follows: These two solutions are prepared:—I. Ferric oxalate, 120 grains; water, 1 ounce; oxalic acid, 8 grains. II. No. 1 solution, 1 ounce; chlorate of potassium, 2 grains. It is presumed that the solution will be prepared in convenient quantities with the ingredients in the proportions mentioned. Considerable care must be exercised that both these solutions are protected from actinic light, otherwise the ferric salt will be speedily reduced to the ferrous salt. This can be detected by taking a few drops on a glass plate, and mixing with it a drop of a solution of ferricyanide of potassium. If any blue coloration takes place there has been a reduction, and the solution is unfit for use.

The sensitizing solution is prepared as follows: III. Potassium chloroplatinite solution (80 grains to 1 ounce of water), 24 drams; No. 1 solution, 22 drams; distilled water, 4 drams.

This should give very soft and deep black prints. If greater brilliancy is required the following variation of III is advised: IIIa. Chloroplatinite solution, 24 drams; solution No. 1, 18 drams; solution No. 2, 4 drams; distilled water, 4 drams.

When results corresponding to silver images are desired the following variation of III is advised: IIIb. Chloroplatinite solution, 24 drams; solution No. 1, 14 drams; solution No. 2, 8 drams; distilled water, 4 drams.

For very weak negatives, reproductions of engravings, etc., the following modification of III is advised: IIIc. Chloroplatinite solution, 24 drams; solution No. 2, 22 drams; distilled water, 4 drams.

The addition of No. 2, or chlorate of potash solution, increases the contrast in the image as it reduces the platinite to a platinic salt. It will be obvious, therefore, that by a judicious use of it brilliant prints can be obtained even from weak negatives. If the pictures possess no black shadows, as, for instance, in the reproduction of pencil drawings, the above mixtures may be diluted with half or even equal volumes of water. Distilled water should always be used.

I do not follow the directions given
 Sizing and Coating for coating the paper, but do this in my own way, as follows: I take paper seldom larger than 16 x 18 inches, usually 10 x 12 inches and often as small as 3 x 4 inches. One of my favorite sizes for portraits is a half-sheet of pale gray writing paper, without water mark. I size my papers with Hübl's formula, putting in an excess of alum, as most of my papers need this. My corrected sizing formula is as follows: Water, 15 ounces; gelatine, 75 grains; alum, 45 grains; methylated spirit, 3 ½ ounces.

Very hard papers I seldom size. For other papers I usually give one coating, and for thin Japan papers, two, three or four coatings. I work on a table with the yellow shades pulled down, my sized and dried sheets of paper simply laid on a large clean newspaper before me. I keep my solutions, I, II, III, etc., near in bottles and mix in a saucer just sufficient for two or three pieces of paper. This I do by means of a medicine dropper, washing it carefully after dipping it in each solution. I take my formulæ from the four quoted for different grades of contrast—by drops instead of drams, and I use rather more water than the formulæ prescribe (this, because platinum is so abominably costly!). Then I brush on the sensitizing mixture with a wide, very soft sable brush, and I find that surprisingly little liquid will thus cover the paper evenly. A pad is not as suitable, because it roughens the surface of the finer papers, and always requires more solution than the brush.

I do not bother with drying closets or
 Drying the Paper impimenta of that sort, but simply pin my sheets to the wall behind or near the hot water radiator, and they dry quite satisfactorily in a

few minutes. If the radiator gives no heat, I pin the paper behind the side gas-light on the wall, which is perhaps fourteen inches from the wall. All this, of course, is a woman's way, but it works! Other simple ways will suggest themselves.

I am especially addicted to Japanese papers, the falsely called vellum (really a fibrous yellow paper), the thin India papers, the bibulous tissues, etc., all of which I buy from Lionel Moses, of Duane street, New York. Of course I use water-color papers also, charcoal papers and any other paper which seems most suitable for the negative. I rarely keep sensitized paper stored, preferring to prepare it as I need it, the preparation consuming very little time. Of course, this would not do for professionals or large consumers. But I am only an occasional picture-maker, and can afford to do things on a small scale, and so get more pleasure in the doing.

This home-prepared paper is, of course, somewhat slower than the W. & C. paper. I wish I knew how to increase its speed, but I do not find that the few drops of water I add to the given formula have any influence in this detail. Sometimes I give a hot development, as Hübl specifies, but just as often I print a little longer and use my developer cold. I always use the W. & C. developing salts, adding a little mercuric chloride if I want brown prints. But I use my developer two or three times as strong as their directions call for, strong platinum development being a fad with me, and most suitable for many of my negatives. To digress a moment, I have often wondered why people do not more frequently vary their printing and developing. They could get very considerable variety in their prints by so doing, and sometimes improve their prints.

In handling the thin bibulous papers great care is necessarily required. Such papers will need three or four applications of size, but with the brush this does not present unusual difficulty. In printing such papers I put a piece of white paper behind so that the faint image will be more easily discernable, and the exposure is made on

previously ascertained data. For the developing and clearing, thin papers should be pinned by the corners to a sheet of stout paper or thin card, and the developing solution quickly poured over the print. I *never immerse* my prints. When developed, lift the prints carefully into the acid clearing solution, which needs to be changed only once. Washing should be done by changing the water, and not in running water, because of the rottenness of the paper.

If the corners of the print get turned over, do not attempt to lift them until the print is thoroughly dry, or you will inevitably tear the print. When it is dry, lift the print from its paper support, straighten it out carefully, and press it face down with a moderately hot iron. I press all my platinum prints.

I trust this account has not seemed tedious. The home-preparations of platinum papers is not difficult for the amateur, as is generally supposed. After the first few failures have been corrected, it is, indeed, the easiest of operations, and much simpler than the gum process.

BOOKS

The only work dealing with the modification of platinum prints is the reprint from *Camera Notes* entitled "The Camera Notes Improved Glycerine Process for the Development of Platinum Prints," including the experiments of Joseph T. Keiley and Alfred Stieglitz; illustrated with reproductions in color from prints by the experimenters. 12 pages, with plates. Paper, \$1.

Der Platindruck (Vol. 13 in the "Encyklopädie der Photographie") by A. F. von Hübl, should also be mentioned as the latest treatise on platinotypy in general.

NOTES

Mr. Thomas Manly, inventor of the Ozotype process which has won so much favor since its introduction, has very considerably modified the method, clearing away the little difficulties incidental to all new methods. A full account of these improvements, together with a new method of working Ozotype, may be found in the July number of *Wilson's Photographic Magazine* [Edward L. Wilson. New York. 30 cents.] A new Ozotype manual is promised, to be ready within a few weeks. Meanwhile the following résumé of the new materials available will be useful to those interested in Ozotype:

- (1) A new sensitizing solution.
- (2) A special sizing solution which will keep indefinitely, and is liquid at ordinary temperatures. It is applied to the paper by means of a sponge, flannel or brush, and dries rapidly. Should any streaks appear while drying, they may be rubbed off by a heavy pressure of a dry cloth, but unless they are very pronounced they will not show on rough paper when dry. One or two coats may be given, according to the absorbent quality of the paper.

Quite a number of sheets of paper can be sized in an hour, and as they will keep indefinitely, an hour's work one evening will provide material for a long time to come.

Fish-glue may be mixed as usual with the sensitizing solution for soft effects, and as many workers have been very successful with it, LePage's best photo-engraving glue, diluted ready for use, is included in the new price-list.

- (3) The paper for coating which is now sent out by the Ozotype Company is specially sized by machinery, and does not require the addition of fish-glue or other sizing material.

- (4) The new pigment plasters have been greatly improved, and give great richness of color.

(5) A ready-sensitized paper will be put upon the market at the earliest possible date. It will keep with ordinary care for at least a month, but there is no occasion to store it for more than a few days or a week, as, thanks to the liberty that can be taken with Ozotype in the direction of leaving off work and starting afresh at a more convenient time, the sensitized paper can be printed and washed, and the remainder of the operation deferred.



Retarding sheets, tissues of superior quality in various tints, for modifying the results in printing from thin negatives, and similar uses which will suggest themselves, are a useful novelty introduced by Edw. W. Newcomb, 888 Bible House, New York. From the same enterprising manufacturer we have information of a Ka-ki apron, made of government duck, and intended for dark-room or work-room use. The Ka-ki apron sheds water and chemicals, is always fairly pliable, and lasts longer than the fragile rubber material hitherto offered. Mr. Newcomb also offers a trial set of all his photographic preparations for the nominal price of 50 cents the set, postpaid. This offer is specially intended for readers of this magazine, hence THE PHOTO-MINIATURE should be mentioned in ordering.



Dr. Jacoby's sepia platinum paper, with Whatman surface, for cold-development, can now be obtained in this country from the importer, W. Huermann, 103 Cedar street, New York. We have secured most desirable prints with this paper and can recommend it with every confidence.



Dealers in photographic supplies who have not received a supply of the new poster advertising THE PHOTO-MINIATURE series, can obtain copies by sending their business cards to the publishers of this magazine. The poster makes an attractive argument and will compel attention if it is displayed.

Since THE PHOTO-MINIATURE began we have steadily advised, as the most perfect of hand-cameras, that class of instruments which permit the subject to be seen right up to the moment of exposure. Sometimes this is accomplished by means of two lenses, one to project the image on a full-sized finder at the top of the camera, the other projecting its image on the plate in the usual way. A better plan is that which accomplishes these two ends with one objective, such as the new Graflex introduced by Folmer & Schwing, 404 Broadway, New York. Those who would be informed concerning this instrument, which must certainly be pronounced one of the most remarkable cameras available at the present time, should ask the manufacturers for a copy of their Graflex booklet.



Mr. Ralph J. Golsen, Chicago, sends us what he properly describes as a "Mammoth Catalogue" of photographic apparatus and supplies. This has been a year remarkable for photographic catalogues of unusual completeness and attractiveness, but Mr. Golsen's latest effort surpasses any within our acquaintance in these particulars. It runs over 274 pages, 8 x 10½ inches, is crowded on every page with interesting information, and is illustrated with over a thousand engravings, cleverly arranged and printed. A copy can be obtained by sending 10 cents to cover the postage. The volume is easily worth ten times that amount as a photographic reference book, in which capacity it will fill a handy place on our book-shelf.



The following letter relating to Collinear lenses speaks for itself:

Editor THE PHOTO-MINIATURE.

Dear Sir: On page 551 THE PHOTO-MINIATURE, No. 36, we read the remark made by Dr. Miethe to the effect that the Collinear lenses cannot be used separately, that is to say, that one combination consisting of three glasses will not make a good picture.

Dr. Miethe may have said this from a theoretical

standpoint, but one thing is certain, and that is that we make some very nice landscapes with single combinations of the Collinear lens, and a number of our customers who have used the Collinear in this way frequently send us excellent pictures taken with single combinations of the Collinear lens.

So good are these results that we advertise the lenses in our catalogue to work with the back combination alone.

We wish that you would make mention of the above facts in *THE PHOTO-MINIATURE*, as already one or two have written to us and expressed surprise at the statement on page 551. Yours truly,

The Voigtländer & Son Optical Co., N. Y.



In the last number of *The Photographic Journal* (London), dated June 30, there is begun an "Index to Current Photographic Literature" which cannot fail to prove of great service to all students of photography. This work, involving a large amount of labor, has been attempted in many journals during the past few years. We hope that the editor of *The Photographic Journal* will be encouraged to persist in his useful work.



An International Exhibition of Photography and Allied Industries is to be held at Amsterdam, August 28 to September 8. The coöperation of American photographers and manufacturers of photographic apparatus is earnestly desired. Full particulars can be obtained from J. R. Planten, Consul General for the Netherlands, 224 William street, New York.



C. P. Goerz has just introduced a new lens of the symmetrical type. Each combination consists of two lenses, enclosing an air space. The lenses are comparatively thin, which implies less loss of light from absorption, but the greater number of reflecting surfaces may be looked upon as an opposite factor. The intensity of the more rapid series ranges from $f/4.5$ to $f/5.5$. The

slower series has an aperture of $f/6.3$. The focus of the lens may be taken as the measure of the length of the plate, sharply covered at full aperture, excepting in the sizes exceeding about 7 inches. The covering power of the latter is rather less. Although the combinations are very close to each other, the angle of good definition appears to be restricted to 62 or 66 degrees. It will thus be seen that the new lens will not supplant many of the well-known types of anastigmatic lenses, which may be looked upon as universal instruments, owing to their comparatively large aperture and wide angle of defining power. On the other hand, the rapidity of the new lens will be found a great advantage. A few sample instruments may be seen at the office of C. P. Goerz, 52 Union Square, New York.



A recent number of "Das Atelier des Photographen," the best of German journals devoted to professional photography, is embellished with a clever example of three-color portraiture from life, made by Dr. Miethe, the editor of "Das Atelier." The print is a three-color process print and is noteworthy as showing that portraiture in colors is possible from the professional photographer's viewpoint. The photograph shows a young lady sitting in a wicker chair, and shading herself with a red parasol. The play of color caused by the interposition of the parasol is charming. According to the text accompanying the print, the photograph was secured by three exposures upon one plate, the total of the exposures being $5\frac{1}{2}$ seconds only.



A remarkable and amusing picture accompanies Commander Wainwright's article on Annapolis in *The World's Work*. It is one of the series by Frances B. Johnston illustrating the story. In it President Roosevelt has just given the Academy's diploma to the smallest graduate in this year's class. He has accompanied the diploma with a bit of pleasantry that has set everybody in the group behind him laughing. The photographer has caught spontaneous mirth on nearly

every face. The boy is turning from the President with a mixture of laughter and self-restraint, and the President's attitude, with his mouth wide with good humor, makes one of the happiest portraits of Mr. Roosevelt we have seen. A near glance at the picture brings spontaneous laughter to those who then get the scene second-hand.

BOOKS AND PRINTS

An Index of Standard Photograms. A guide for authors, editors and publishers of illustrated books and periodicals; collectors of pictures and extra-illustrators; lecturers and teachers who use lantern-slide illustrations. Arranged by H. Snowden Ward, and compiled by the staff of "The Photogram." About 750 pp., $7\frac{1}{2} \times 10\frac{1}{2} \times 1\frac{3}{4}$ inches. Cloth bound. Published by subscription only: in England, 30/; in America, \$10. London: The Photogram, Ltd.; New York: Tennant & Ward.

In this substantial volume, to the preparation of which Mr. Ward and his co-workers have devoted a considerable portion of the past three years, we have an attempt to list and classify the world's store of photographs, as far as they are purchasable or available for illustrative purposes. The growth of illustrated journalism and book-making has made some such guide indispensable, and we trust that Mr. Ward and his associates will reap the reward their labor and enterprise deserve.

The book is divided into sections covering every department of human interest and activity — portraits, landscapes, views, architecture, naval, military, literary, historical, natural science and similar subjects. A full general directory enables the reader to make instant reference to the source whence any photograph included in each department may be obtained. As an example: Suppose we desire to illustrate an article or book on mines and mining, we turn up "Min" under miscellaneous subjects and find 22 references to the "General Directory" by means of which we are told where we can obtain photographs illustrating the mining indus-

tries of Cornwall, North Wales, Australia, Colorado, Canada, Klondike, Transvaal, New Zealand, California, Pennsylvania, Norway, and a further reference bringing to light similar illustrations on mine views made at Kimberley, South Africa; Idado, British Columbia, Mexico, etc.

It is, of course, not to be expected that the first attempt at so gigantic an achievement can be either complete or perfect in contents and arrangement. But the greatest praise is due to the compilers of the work for the care and skill with which they have accomplished their task. The records and information the book offers will prove invaluable to those for whose helping it was made, and we have pleasure in bringing it to the attention of our readers.



The last issue of the *Photo Ticker* is enlarged to 12 x 15 inches and is printed in four languages, with over 100 illustrations and some lively reading within its 26 pages. In his foreword the editor says: "We claim for the *Photo Ticker* originality and the truth. It is not published to swindle photographers out of their \$ \$ under the subscription bluff, nor is it dependent upon the charity of advertisers. This is so *different* from the most of the photo publications! The *Photo Ticker* is free, is independent, and is published whenever there are sufficient new ideas to fill its pages—and there you are." The *Photo Ticker* is published for all who want it, and a postal card to W. P. Buchanan, 1226 Arch St., Philadelphia, will secure a copy if this magazine is mentioned.



Photographic Printing Processes. By Louis H. Hoyt (Dime series, No. 2). 116 pp., 3¼ x 5½. 10 cents. Chicago: The Photo Beacon Publishing Company. New York: Tennant and Ward.

This second volume of Todd's Dime Series embodies in permanent form the papers on the various printing methods contributed to the *Photo Beacon* by its author. Its information is plainly given and to the point.

Tennant and Ward's List OF NEW BOOKS AND PUBLICATIONS

THE LADY POVERTY. A XIIIth Century Allegory, telling how St. Francis of Assisi wooed and won that most difficult of all brides, my Lady Poverty. A delightful volume for all interested in Franciscan and mediæval literature. Written A.D. 1227, now rendered into English for the first time. Translated and edited by MONTGOMERY CARMICHAEL. 209 pp. Cloth, *net*, \$1.75.

AMERICAN PICTORIAL PHOTOGRAPHY. Representative examples of the work of the American School of Pictorial Photography. Selected by and reproduced in photogravure under the personal supervision of ALFRED STIEGLITZ, and formerly published by "Camera Notes." Series I, *net*, \$10. Series II, *net*, \$6. The edition was limited to 150 copies of each series, and only a few sets are obtainable. Descriptive circular on request.

THE "CAMERA NOTES" IMPROVED GLYCERINE PROCESS for the development of platinum prints, including the experiments of ALFRED STIEGLITZ and JOSEPH T. KEILEY. Illustrated with facsimile reproductions in color, by the experimenters. Reprinted from "Camera Notes." Only a few copies obtainable. Paper covers, *net*, \$1.

AN INDEX OF STANDARD PHOTOGRAMS. Being a guide for Authors, Editors and Publishers of Illustrated Books and Periodicals, Collectors of Pictures, etc., listing photographs available for publication purposes. Sold by subscription only. Particulars on request.

PHOTOGRAPHY FOR NATURALISTS. By DOUGLAS ENGLISH. A book for those interested in photographing animals, etc. 132 pp., fully illustrated. \$2.50.

PRACTICAL NOTES ON TELEPHOTOGRAPHY. By BECK LTD. A pocket-book of practical information. Cloth, 25 cents.

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THE A B C OF PHOTO-MICROGRAPHY. A practical handbook for beginners, by W. H. WALMSLEY. With plain instructions and many engravings. About 130 pp. Cloth, *net*, \$1.25.

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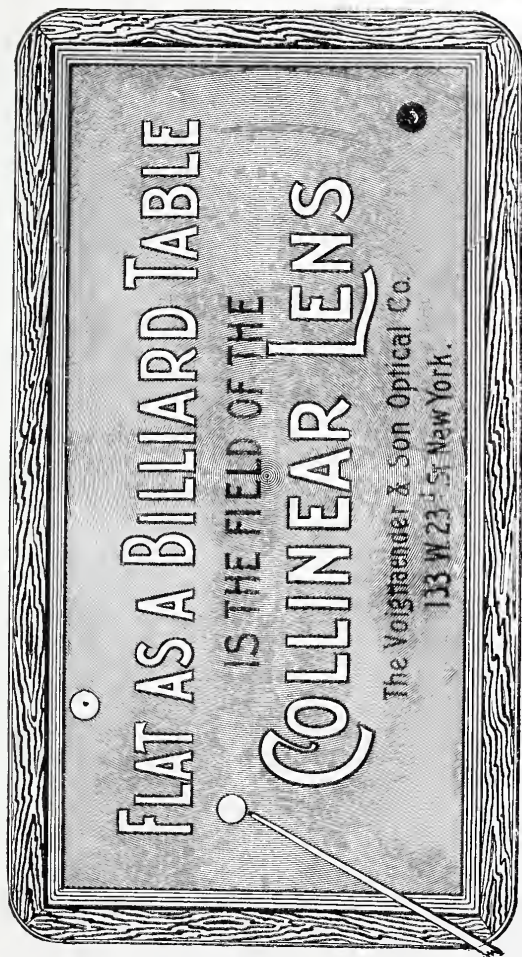
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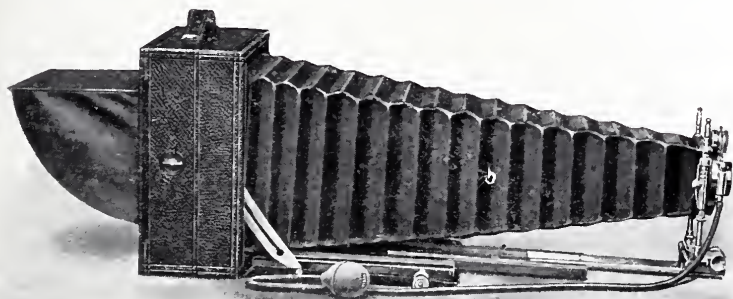
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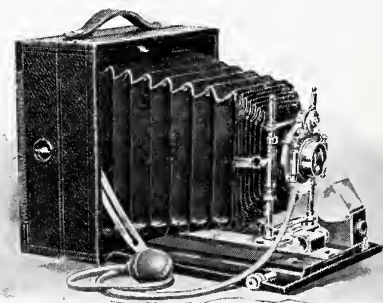
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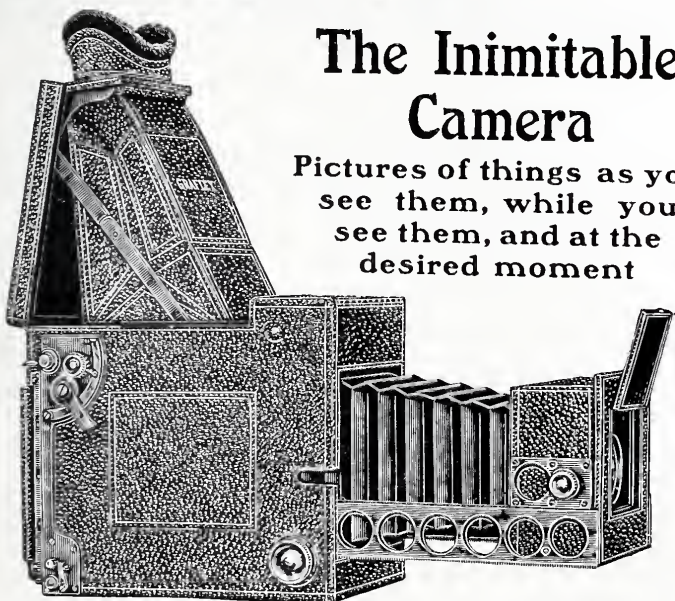
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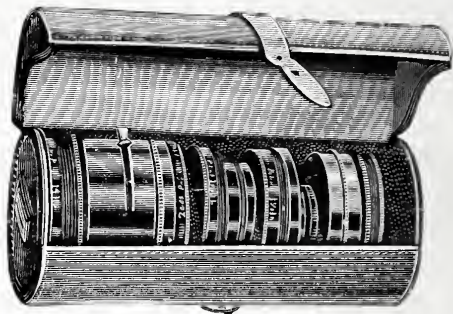
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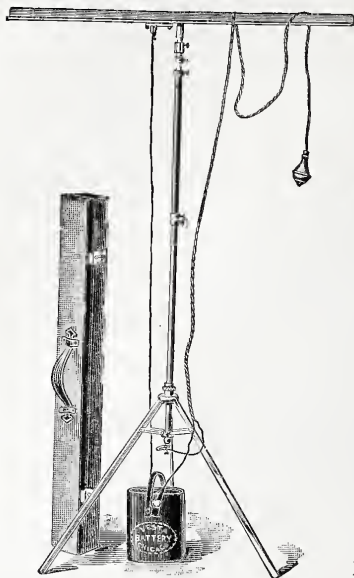
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The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT

Volume IV

AUGUST, 1902

Number 41

COPYING METHODS

The monographs thus far published in this series have, almost exclusively, dealt with the direct photographing of actual objects of interest: people, flowers, animals, landscapes, interiors, clouds and the like. In the following pages we take a new direction, and will concern ourselves wholly with copying methods: the photographing of pictures, prints or representations of things rather than the objects themselves. The field offers much of real interest alike to professional and amateur photographers, but has been strangely neglected. One wonders why there are not half a dozen goodly volumes devoted to its keen delights and innumerable difficulties! To the professional a practical knowledge of copying methods means a very profitable specialty; to the amateur these methods offer a home-hobby abounding in pleasure and usefulness. I need not speak of the great industries of Braun, Hanfstaengl, and others established on the world's demand for copies of the masterpieces of painting. My purpose here has smaller scope and intention. In every city and hamlet, nay, in almost every home, there are prints, pictures or records of priceless local or personal interest. Too often these are allowed to perish, lacking care and appreciation. How desirable it is that we should have copies of them, securing the shadow ere the substance fades, for our own pleasure as well as for the information of those who will follow us through this changing world. And if this be true—as it is true—of the cities and homes of the old world, rich in relics of the past, how much more is it applicable to the towns and

homes of this new world of ours, where today is so feverishly worshipped and the yesterdays are so soon forgotten.

I remember an advertisement published a few years ago, asking for old daguerreotypes. The advertiser desired to revive the old art and, not finding the necessary silvered plates ready to his hand in the market, bought the old daguerreotypes from all who would sell them, wiped away their precious records and so obtained the supply of plates he desired. The response to his advertisement was overwhelming, and thousands of daguerreotypes were sacrificed for the few pence offered. Latterly, however, there has been an awakening of public opinion, and the pictures of old time—daguerreotypes, ambrotypes, prints and the like—are today held in high esteem. It is extremely desirable, I repeat, that many of these should be copied and their preservation assured in the form of permanent photographic prints. Here, then, is our mission, purpose sufficient for this little book.

The first and last things to be remembered concerning the copying of pictures, prints, documents or graphic records of any sort is that each and every subject demands individual care and treatment. No book can give specific instructions as to the best way of obtaining copies of this or that. The successful reproduction of a print depends most largely upon the worker, upon his knowledge of the methods available, and his personal application or modification of these methods to his purpose. In these pages, therefore, little more than general information can be given. With a right understanding of what is given herein, however, the reader can assure himself of success. We will consider first the equipment needed for copying in general. Much of this can be dispensed with according to the circumstances or inventive or adaptive powers of the individual worker. Later we will survey the field as divided broadly into subjects in line (engravings, etc.), and subjects in tone (photographs, paintings, wash-drawings, medals, etc.). Finally we will take up a few special subjects, from the treatment of which the reader

can readily perceive how he may apply this or that method to this or that subject in his own experience.

The camera and lens generally used for outdoor work will usually serve for copying purposes, but there are important exceptions which will be seen as we go along. The only essential extra required from the beginning is a copying board, or arrangement for carrying the camera and the original to be copied, so that the former can be moved to and from the subject in a straight line and at right angle to it, with the perpendiculars of plate and subject parallel.

In copying we usually photograph a perfectly flat object containing lines. We need, therefore, a lens which will give a sharply defined image on a flat plate, in which the straight lines of the original are rectilinear. In other words, we want flatness of field without distortion, and if we get these we can dispense with great rapidity. Other things being equal, the less the focal length of the lens used for copying the better, because the camera-extension required will be less. To obtain a copy of the same size as the original the distance between lens and plate must be exactly twice the focal length of the lens, and it often happens that a camera will not rack out far enough to allow the lens fixed to it to be used for this purpose. Hence the advantage of a lens of short focal length. Still it is not hard to get over this difficulty, as we will see later.

The single or view lens, according to the catalogues and text-books, is not suitable for copying, because it gives distortion, or a bowing out of the straight lines toward the edges of the plates, and has not a flat field. But this is correct only when the lens is being used to cover a plate rather large compared with the focal length of the lens, say a lens of five or six inches focal length on a plate $3\frac{1}{4} \times 4\frac{1}{4}$ inches; or a 7-inch lens for a 4×5 -inch plate. But a lens of nine inches focal length will cover a 5×7 -inch plate completely to its edges without appreciable distortion, and with an almost flat field. I speak here, of course, of ordinary good single or rapid

rectilinear lenses. The modern anastigmat is peculiarly corrected to give a perfectly flat field within its circle of illumination. Hence the contingencies of distortion and lack of flatness of field need not be considered by those who possess an anastigmat. In using a single or view lens, as above mentioned, we are, in fact, using only the central part of the lens's field, and here these two defects are very small. I once copied some hundreds of line diagrams for lantern-slides, using a 5-inch view lens for an image which was usually about $2\frac{3}{4} \times 2\frac{1}{2}$ inches, and in very few cases was the bowing of the lines in the slightest degree noticeable. When using a single lens at this "narrow angle" a greater extension of camera is needed than with more expensive rapid rectilinear lenses of lesser focal length compared with the plate, which will do the work equally well, and as a general rule it is better to use a rapid rectilinear lens. I mention the single lens, and the precautions to be observed with it, for the benefit of those who have no other at hand.

For an all-round lens for copying
Better Lenses there is little advantage in getting a more costly one than a rapid rectilinear working at $f/8$, and such a lens can be purchased for a very moderate amount. Anastigmats such as the Goerz, Voigtlander, Cooke, Double Stigmat, Protar, Unar, Planar, Plastigmat, Stigmatic and Holostigmat are all practically perfect for copying, and those who possess them will doubtless use them for this purpose. In undertaking very fine and delicate work, such as the copying of large plans containing fine lines, or ancient documents, the anastigmat is an absolute necessity. For the amateur copyist, however, the cheaper rapid rectilinear is all-sufficient.

The lens generally used for studio
Portrait Lens portraiture will serve as a copying lens if of fairly great focal length. To cover a 4 x 5 plate we must have a lens of nine or ten inches focal length. This naturally means a bulky camera, and the size of the lens is a drawback. Those who happen to have it may use it with success, fashioning the camera to fit it.

Using a Pinhole For copying pictures or prints which are desired chiefly for decorative purposes, those so inclined can obtain all they desire with the humble needle-hole in place of a lens. This will not give exquisitely sharp definition, but it will cover a plate of any desired size, and has other advantages. I reprint an extract from THE PHOTO-MINIATURE No. 27: *Pinhole Photography*, in which Mr. Thomson tells of his experience in this direction:

The rectigraphic quality of the work done by the needle-hole makes such a camera capable of rendering important services to artists, designers, architects and others, who desire to have their drawings copied in one scale or another with mathematical accuracy; and one can conceive of quite a number of industrial purposes for which such a means of easy and exact reproduction would prove a great boon.

The method of procedure in copying is very simple. To prepare the camera we set our plate at the back of the camera so as to give a plate distance of eight inches from the needle-hole. I recommend this distance for two reasons. It enables us to work farther back from the engraving we are copying, so as not to interfere with the light upon it; and it makes the calculation of the proper copying distance a somewhat simpler matter. Any other plate distance, however, will give equally good results, so long as care is taken to avoid shadowing the picture. Any method of fixing the engraving may be adopted that will enable the front of the camera to stand exactly parallel to it. For an engraving of moderate size, as good a way as any is to lay it flat on the floor, or on a table, close to a well-lighted window, and by some simple arrangement photograph downward, taking care, of course, that the camera is set quite perpendicularly.

The principle of determining the copying distance is extremely easy of application. If we want to copy equal size, the plate distance and the copying distance must be equal, i.e., the needle-hole must be eight inches from the engraving. If we desire to reduce the diameter of the picture to a half, then the plate distance

would be half of the copying distance, i. e., the needle-hole would be sixteen inches from the engraving; and so on over the whole range of proportions.

Except where for some special reason a particularly soft effect is wanted, it is best to copy with one of the smallest apertures. Book pictures copied through a No. 11 or No. 12 needle-hole make beautiful lantern-slides. Here is a means of illustrating lectures, etc., with the minimum of trouble.

The exposure will, of course, be much longer than with any lens, but if the original and camera be firmly fixed this matters little. For the making of souvenirs, Christmas cards or decorative panels this method offers convenience and practical results. The prints should preferably be made on a rough paper to secure the utmost effectiveness.

For the majority of workers the adaptation of the ordinary hand- or tripod-camera for copying purposes is more important than the construction of a copying-camera proper. We will consider this adaptation first. There are several ways, optical and mechanical, by which we can copy small objects even with a fixed-focus box-camera, or a folding camera of the Kodak type. The average hand-, stand- and tripod-cameras come nearer the requirements for copying, but these also require adaptation for our present purpose.

Fixed-Focus Box-Cameras The reason why it is difficult to use a camera of this kind for copying is that in photographing near objects the rays of light fall on the lens in a divergent condition and are brought to a focus further away from the lens than the plate, for this latter is fixed at the place where parallel rays, from a distant object, come together. Now we cannot alter the position of the plate in the camera without spoiling it for all other work, but we can decrease the focal length of the lens so that its extended focal length, when focused on a near object, is no greater than the normal distance between the lens and the plate. We do this by fixing a converging or convex lens in front of the ordinary lens. This assists the bending of the rays and brings them to a nearer focus.

Such an auxiliary lens is called a magnifier, or, when of moderate power, a portrait attachment or enlarging lens. Many cameras are fitted with these magnifiers to enable them to copy objects up to two feet distant, but I do not know of any permitting one to copy same size or to slightly enlarge except the Ideal enlarging lens, made by Burke & James. The principle of all is the same; viz., the shortening of the focal length, and the rule for the focal length of the lens to be added is: *Fix before the lens a convex lens of focal length equal to the distance of the object.*

Thus, with a fixed-focus camera of any extension, an object twelve inches away will require a 12-inch convex lens on the front of the camera lens. A spectacle lens, mounted in a cardboard tube, slipped over the hood of the camera lens, or secured to the camera front, serves as this extra lens. These can be obtained of various focal lengths. Or an ordinary convex reading-glass is fixed close in front of the lens on the camera front. Both may be wanted for copying same size or enlarging.

Focusing with Fixed-Focus Camera As the camera will have to be removed for the insertion of the plate, a pair of thin wooden guides must be fixed on a board, so that, after focusing, the camera can be removed to the dark-room, the plate put in, and the camera replaced as before, the exact position of the back being marked on the board with a lead-pencil. A slip of ground-glass is placed in the camera, the back and sheaths being removed, and focusing done by moving the original, which is within easy reach. A fairly small stop must be used to provide against any slight alteration in the position when the camera, with plate *in situ*, is replaced.

Focusing Hand-Camera This form of camera is slightly more adaptable than the fixed-focus box, as the lens can be racked out to bring objects four feet or so away into focus; but the "magnifier" must be used to do the rest, as just described. With some cameras the whole of the front carrying the lens can be removed, and then a hood or wooden cone can be affixed, which will give us the necessary extension for copying same size.

Hand Stand-
Cameras

Many of the instruments belonging to this popular type of camera do not extend to double the focal length of the lens, which is necessary for copying same size. These require an extension attachment which, if only short, is best fitted to the front. If of considerable length, say six inches or more, it should be fitted to the rear of the box. An extension of an inch or so can be gained by fitting the lens to one end of a tube, the other being screwed or pushed into the flange. Brass makes the best job for this extension tube, but thin strawboard, wetted to make it bend without breaking and then glued to form the tube and dried, answers well enough. The tube must not be more than an inch or so in length, or the back end will intercept some of the rays from the lens, with the result that the edges of the plate will be badly illuminated or not covered at all.

The rear attachment mentioned is the only practical way of extending the usual folding camera considerably. A frame or box, open at each end, is made to fit into the place of the reversing back, which latter is fitted to the other end of the frame. The depth of this frame is adjusted to give the extension needed between the lens and the plate. For a 5-inch lens this total distance should be at least twelve inches, measuring from the back surface of the glass in the case of a single lens, or from the stop in the case of a doublet. Copies slightly larger than the original can then be made.

Copying
Cameras
Proper

These, as offered commercially, are usually of square section, giving ample extension, have rising and laterally movable front and a swing back (see "Copying Distorted Prints"), and the back carrying the plate should rack in and out for focusing—not the lens. This back should have no "cross" movement, but should always remain parallel with the front, and therefore exactly at right angles to the axis of the lens. A much larger size of camera than the plate to be covered is a great advantage, because then no light is cast by the lens onto the bellows, and from them reflected onto the plate. Some of the clearest line negatives I have made were taken on 4 x 5 plates in a 10 x 12

camera, using a 6-inch lens. A copying camera, it will be seen, need have no elaborate movements; and while solid square-bellows cameras, such as those made by Burke & James, Anthony & Company, Rochester Optical Company, or Watson, or Hurman, Ltd. (England), answer the purpose well, the handy home-worker can well make one for himself, purchasing the holder and brass-work required.

The Copying Board Some means of moving the camera to and fro squarely to the original is, as we said, absolutely essential. After using quite a number of patterns, I have found none better than the one here described, a form due I believe to Professor Humboldt Sexton, of Glasgow. A couple of deal-boards are screwed to three cross-pieces so as to leave a $\frac{3}{8}$ -inch space between them. The camera is screwed to a solid block fixed to a fairly heavy base-board, on the under side of which a $\frac{5}{8}$ -inch strip of wood is fixed, and serves as a guide to the camera to and fro upon the board. A heavy support is best, as the camera then moves steadily and is not liable to move when inserting the plate-holder or withdrawing the shutter. At one end of the board an easel is fixed; it is screwed to a base-piece and supported by angle-pieces, the whole being fixed to the long board

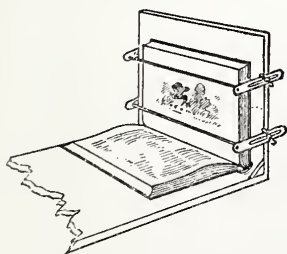


FIG. 1

by a screw and washer. The hinged rods attached to the easel (Fig. 1) are of brass or nicked iron; ordinary stout iron wire is apt to rust and mark the book or paper gripped by it. Each rod is held in place by two screws working in metal bushes fixed in the ends of the easel, and the two will hold the most clumsy book firmly in position with the page spread out flat. In fixing the book, the two screws on one side are secured so that the rods lie flat over the page, and the volume is then clamped by springing down the free ends of the rods and making fast the screws.

A backing of cardboard is used when clamping down thin paper originals. The board should have a vertical and a horizontal line drawn across it, to make the middle point, in these directions, on the focusing screen.

For the convenience of English readers I reproduce a copying stand made by a London firm. As the illustration shows, this is a base-board upon which there is a carriage to take the camera, while at the other end is an easel with arrangements for shifting the original from left to right, or vice versa, as may be desired. The apparatus measures but 6 x 8 x 24 inches when closed,



FIG. 2

and offers a most convenient form for copying prints and similar subjects which can be affixed with thumb-tacks (see Fig. 2).

A Simple Stand

Writing in the *Photo Beacon*, J. E. Hounsom gives the subjoined description of a simple copying stand, with diagrams. This does not present formidable difficulties to anyone handy with tools. He says:

My first copying was done by taking a leaf from the dining-room table and using it as a base-board, placing the camera on books, or on a box, and supporting the subject by similar means. Naturally, my first attempt resulted in distortion of the subject. It is apparent that such a plan requires a great deal of care and attention to obtain even fair results. As I wished for a stand that would do for enlarging also, I made the following apparatus:

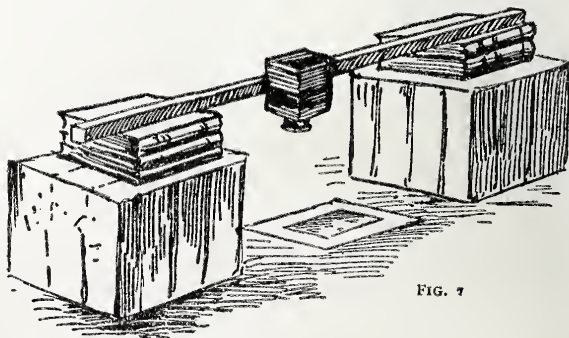
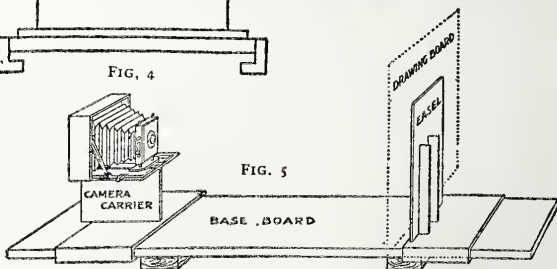
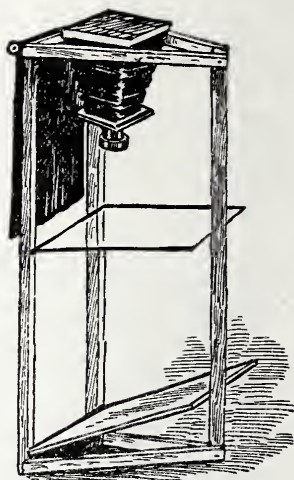
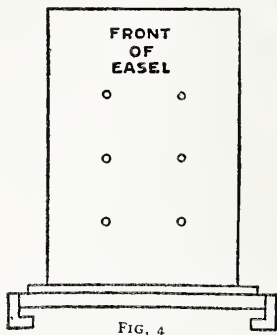
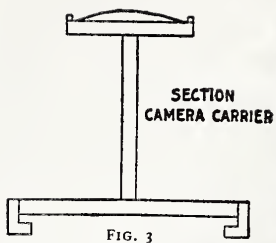
A base-board is the first requirement. Mine is 4 feet 8 inches long by 10½ inches wide, and one inch thick. Strips will be needed on one side for it to rest on, and to enable the carriers in sliding to and fro to move easily; and a carrier for the camera, as in Fig. 3, must be made to slide on the board. This should be just so

high that when the camera is on it the lens points to the center of the board on the easel. The top is made so that the camera fits between strips on the front and sides.

The carrier (Fig. 4) is for the subjects to be copied; it will serve as an easel for small objects. It is well, however, to have a board, made in drawing-board style, to fit on the carrier. Mine is eighteen inches square by half an inch thick. The board with the carriers and camera is shown in Fig. 5. It will be seen that it can be placed at any angle, and can be carried outside or used in the house. It is well, however, always to use it in one place in order to get used to the conditions of light at different times. It is a useful thing where space is very much limited, as it can be turned upside down and suspended from the ceiling. This position is a convenient one for enlarging, as it may easily be put at an angle, and so pointed to the sky.

I have given no dimensions, as they depend upon the material available and the work which is to be done.

Vertical Copying Board To work with the original horizontal and the camera vertical has two very positive advantages: There is no fastening or fixing of the drawing and the most is made of the light obtainable in an ordinary room, the window of which illuminates a horizontal surface a few feet away from it well and evenly. Fig. 6 shows a convenient arrangement. The camera is laid between two cross-bars in the upper frame and the original is laid on the sheet of glass. For copying ferns, flowers, lace, coins, medals and other objects difficult to fasten to an upright board, this stand is most convenient. It can also be used for copying negatives or transparencies by transmitted light, when it is arranged as shown in the figure, the light being cut off from above and reflected upwards by a mirror. In ordinary direct lighting the mirror is absent and the blind is hung over the lower half. The same vertical arrangement can be extemporized as in Fig. 7. The best of copying camera stands, however, which can be used for both horizontal and vertical work, is that designed by J. Horace McFarland, illustrated and described in *THE PHOTO-MINIATURE* No. 13:



Photographing Flowers and Trees. With this stand the worker is equipped for every possible need.

Working on the Tripod When it is necessary to use the camera on its tripod, the legs must be connected so that they cannot slide about. Mellen's tripod stay provides for this, or the arrangement shown in Fig. 8 can be made at home. It

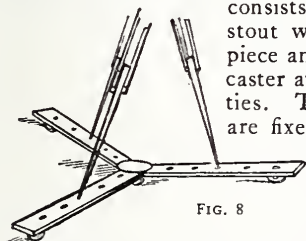


FIG. 8

consists simply of three strips of stout wood hinged to a central piece and provided with a small caster at the center and extremities. The points of the tripod are fixed in holes made in the strips. The convenience of being able to move the tripod to and fro without altering its height or up-setting its level is enormous

when, say, copying pictures in a gallery.

In the absence of such assistance a ball-head on the tripod is a help to the rapidity and comfort of working. The size of the image having been adjusted, the level of the camera in both directions can be adjusted in a moment, and it is very necessary to get things right in this respect, for if the upper edge of the plate is not horizontal the picture will not be straight on it, and if the plate is not vertical when viewed edgewise, the parallel lines in the picture will not be parallel in the copy, just as when photographing architecture with a field-camera—always presuming that the original is placed "straight" both ways on the wall.

So much for apparatus. We must now study one or two arithmetical rules which, once mastered, will save us much time in our copying work.

Calculating Scale

When a copy of any object is made with a lens, the size of the copy compared with the original depends on (1) the focal length of the lens, and (2) the distance of the original. The greater the focal length the larger the copy—in exact proportion, e. g., a 12-inch lens gives a copy twice the size of that made by a 6-inch lens, the original being at the same distance from the lens in each case.

The further from the camera an object is the smaller the copy, but in this case the size is not directly proportional (inversely) to the distance, but follows a rule which I give below in form for practical work.

When speaking of reduction of size in copying, linear reduction is always meant unless the contrary is stated. Thus a 12 x 10, copied so that the long side becomes four inches, undergoes linear reduction of one-third ($12 \div 4 = 3$). The number obtained by dividing any length in the original by its length in the copy I call the "reduction figure." Thus 3 is the "reduction figure" in the above case.

Now we can get a practical rule which will tell us at what distance to place the lens from the original and the plate from the lens when copying at any reduction.

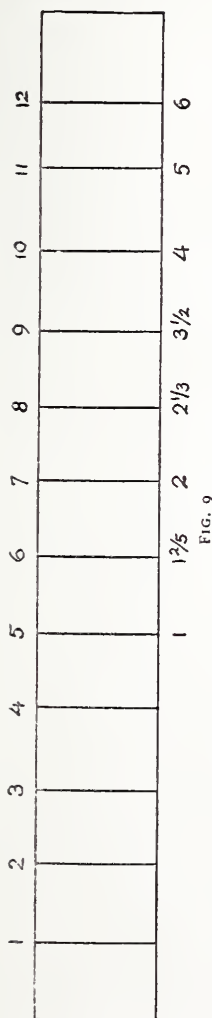
First decide what size the copy is to be, and find the reduction figure by dividing the length or breadth of the original by the length or breadth of the copy. To find the distance between lens and original, *multiply* the focal length of lens by the reduction figure and add one focal length thereto.

To find distance between lens and plate, *divide* the focal length of the lens by the reduction figure and add one focal length thereto.

Thus, in copying an 8 x 10 to 4 x 5, the reduction figure is 2, with a lens of six inches focal length: Distance from original to lens is $6 \times 2 + 6 = 18$. Distance from lens to plate is $6 \div 2 + 6 = 9$.

Notice that one distance is just twice the other. This always holds good, the longer distance equaling the shorter multiplied by the reduction figure.

This same rule is true when making copies larger than the original, only in this case the "reduction" figure is a fraction. Thus, to find the distance from easel to lens and from lens to plate when enlarging a six-inch sketch to nine inches: Here the "reduction" figure is $\frac{6}{9} = \frac{2}{3}$, and with a 6-inch lens we get: Distance from easel to lens $6 \times \frac{2}{3} + 6 = 10$ inches. Distance from lens to plate $6 \div \frac{2}{3} + 6 = 6 \times \frac{3}{2} + 6 = 15$ inches. I know of no simpler or more easily remembered rule than this.



As soon as a lens is used at greater extension than that required for focusing distant objects, the *f*/ numbers on the mount no longer indicate the real working apertures. If the extension is double that for infinity, the *f*/ number is double and the exposure is four times. The rule for finding the correct *f*/ value in any case is to multiply the number on the mount by the focal extension and divide by the equivalent focal length of the lens. Thus the stop marked *f*/11 on a 6-inch lens used at nine inches from a plate is really $\frac{11 \times 9}{6}$, or *f*/16 1/2.

The regular copyist will find it useful to settle down to one stop and to fix a scale against the moving part of his camera graduated with the relative exposures for different extensions. He can thus see at a glance what exposure to give.

I append a diagram drawn roughly to scale showing what I mean (Fig. 9). How to fix it depends on the form of the camera. My own is fixed along the side of the camera at a convenient height. It should be noted that the exposure is proportional to the square of the extension, i. e., to the extension multiplied by itself, not to the single length.

Another very practical way of ascertaining the increase in exposure due to focal extension emanates from Mr. Alfred Wat-

kins. Cut a piece of stick exactly the focal length of your lens. When copying up to same size, see how many lengths of the stick can be got between the lens and the original. The table then gives the time of exposure compared with that required with the lens at its normal extension.

When making enlarged copies direct, i. e., with the distance between plate and lens greater than between lens and copy, turn the stick over and over along the camera, i. e., between lens and plate, and find the number of times to multiply exposure alongside this figure in the second table. The usefulness of this practical plan is increased by dividing up the stick into aliquot parts. Fifths are fine enough for anything, so I have drawn up the tables on this basis.

Relative exposure when copying on a reduced scale.

No. of times focal length divides into distance between lens and easel	2	$2\frac{1}{5}$	$2\frac{2}{5}$	$2\frac{3}{5}$	$2\frac{4}{5}$	3	$3\frac{1}{2}$	4	5	6
Relative exposure compared with lens at normal extension. Approx. fractions.	2	$3\frac{2}{5}$	$2\frac{9}{10}$	$2\frac{3}{5}$	$2\frac{2}{5}$	$2\frac{1}{2}$	2	$1\frac{3}{5}$	$1\frac{1}{2}$	$1\frac{2}{5}$
Exact decimals..	4	3.26	2.93	2.64	2.42	2.25	2	1.76	1.56	1.44

Relative exposure when copying on an enlarged scale.

No. of times focal length divides into distance between lens and plate	2	$2\frac{1}{5}$	$2\frac{2}{5}$	$2\frac{3}{5}$	$2\frac{4}{5}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	$5\frac{1}{2}$
Relative exposure compared with lens at normal extension. Approx. fractions.	4	$4\frac{4}{5}$	$5\frac{3}{4}$	$6\frac{3}{4}$	$7\frac{4}{5}$	9	$12\frac{1}{4}$	16	$20\frac{1}{4}$	25	29
Exact decimals..	4	4.84	5.76	6.76	7.84	9	12.25	16	20.25	25	29.2



COPIED FROM A DAGUERRETYPE
W. M. Hollinger



COPIED FROM A DAGUERREOTYPE
W. M. Hollinger

**Copying
Proper**

Now we come to the actual copying of the picture, pen-and-ink drawing, photograph, oil painting or what-not.

The two requirements in the lighting of the original are that the light shall fall as flatly as possible on to the surface—not from one side or the other—and that it should be even over the whole picture. Daylight is generally best, but for some work artificial light answers quite as well.

Daylight

When working in an ordinary room, place the copying board so that the light falls as squarely on it as may be. It is practically impossible to have it “dead on,” because the camera comes in the way. But make the best compromise you can, and arrange a reflector of white card or blotting-paper to distribute the light upon the copy. Even, flat illumination is one factor in securing a copy free from “grain,” but *only* one factor. The others are full exposure and unforced development. Of these later; but note here that top or side light is best screened off, for this sideways lighting intensifies any grain in the print.

When using a vertical camera, place the stand a short distance from the window so that the light falls flat upon the subject from above.

**Artificial
Light**

This is best suited for copying black and white drawings, engravings or etchings. With photographs, especially of warm color, oil paintings and other colored originals the time of exposure becomes unduly long unless one can use the electric arc light. Moreover, when fairly large originals are to be copied it is difficult to get even illumination. The choice of light must be made between incandescent electric, incandescent gas, Argand or batwing gas-burners, and oil lamps; with acetylene as is possible. Whichever is used, the lights must be arranged one on either side of the easel with screens behind so that not a single ray can fall directly from them onto the lens. Such stray light on the lens is a certain cause of fogged flat negatives, and I have known not a few cases where it long remained an unsuspected cause of trouble. The screens may be of polished tin-

plate, blacked on the side remote from the light; but white cardboard, likewise blacked on one side, does equally well.

Which light to use is largely a matter of local circumstances. If there is electric connection, a pair of 25-candle-power lamps will prove a boon in use. For gas, the incandescent is the most powerful, and, barring the breakage of mantles, the best of all; but I used two Argand burners with every satisfaction for several years before incandescent gas came into vogue. Oil meets the wants of those away from lighting supply, and for a dollar one can get a circular-wick lamp, complete with chimney and reflector, which gives a very actinic and powerful light quite strong enough for black and white subjects.

Whichever light it be, see that the illumination is equal over the easel, testing by exposing a plate on a sheet of printing. It is difficult to say simply by looking at the lighted surface. With gas, the lights should be adjusted to give equal illumination by means of a tap attached to each burner. These, once set, should be left undisturbed, and the raising and lowering of the lights done by a tap connected to both of them by a T piece.

Roscoe's Device

Another method of illuminating the subject for copying by artificial light is given by A. W. Roscoe, as follows: "I will briefly describe my arrangement for using either incandescent or ordinary gas-burners. Three lengths of ordinary gas-piping ($\frac{1}{2}$ -inch) twenty inches long are required. These are joined up so as to form three sides of a square. One corner is coupled with an elbow, and the other with a T into which is screwed a short length of pipe with a tap in it. A length of rubber tubing is slipped onto this pipe and connected with the gas bracket. This piping arrangement is then fastened with a couple of staples to a board, say, six inches wide and three-fourths of an inch thick, its length being as required by the piping. A hole is made through the board for a bolt, and it is then put on the copying board behind the camera, and can be slid along and fastened where it is best, the object

being to keep the lights one on each side of the camera, and just behind the lens, so that they will not shine into it. The contrivance can, of course, be raised to various heights of the lens, by placing a short piece of wood of the necessary thickness with a bolt-hole through it under the board carrying the piping.

"As a rough guide to exposure, I may say that to copy a good cabinet photograph same size will require about a minute at $f/11$ (varying somewhat with the color of the print) on an ordinary plate with the incandescent burners on. If I am not in a hurry, however, I put two big batwing burners on (Bray's No. 5), and give ten times the above exposure, and the results are equally good. The incandescent burners are delicate; the least knock and off go the mantles.

"The advantages of artificial light are, first, that the light is constant, and exposure soon becomes a certainty; second, that, being evenly balanced on each side of the subject, the grain of the paper is kept down; and third, it is workable at night."

These are a trouble when copying
Reflections glossy prints, paintings or pictures which cannot be removed from their frames. If the whole copying board and fittings be given a coating of dead black the defect should vanish, though sometimes the lens itself and the screws on the camera are reflected by the original onto the plate; the remedy is to envelop the whole camera in a black cloth, leaving a small hole just large enough for the lens.

But it is when copying large pictures in galleries that reflections really pester the copyist; and I would point out to the tyro that usually none can be seen on the focusing screen, though they afterwards appear in painful evidence on the negative. White objects reflected in the glasses covering dark pictures, and *vice versa*, are the chief sources of trouble, and in order to intelligently trace the evil to its head we should recollect how reflection acts. Incident and reflected rays are in the same plane with the normal to the surface at the point of incident [Cole: Photo. Optics.] The law of reflection is that the ray of light makes the same line at right angle to the reflecting

surface after reflection as it did before. In other words, the more obliquely the ray falls, the more obliquely it will pass off again. This tells us that if the reflection falls onto our lens from near the edge of the field, we must look for the object reflected away on an oblique line. This fact borne in mind will often locate objects as the cause of trouble which would otherwise never be suspected.

There is only one correct mode of scrutinizing the picture for reflections, and that is with the eyes as nearly as possible in the position of the lens. Lean back in front of the camera so as to get the eyes directly in front of the lens. Standing on one side or looking over the top is of no use, for a very little difference in position entirely alters the reflections intercepted from the picture being copied.

Avoiding Reflections There are several ways of avoiding reflections. When white objects are the cause, we can cover them over with a black cloth, or we can tilt the picture being photographed just enough to make the reflected rays miss the lens by stuffing a book or pocket-handkerchief behind it, but the most drastic method is to give the picture no chance to reflect anything at all by surrounding it with a black screen. The simplest way I know of doing this is to hold up a screen of black silesia (well scalded and dried absolutely without starch to make it limp) on a couple of bamboos, as shown in Fig. 10, spreading out the cloth while a friend views the picture from the position of the lens. By resting the bamboos on the hips they can be held for a long time without fatigue. The worst of this is that we



FIG. 10



COPIED FROM A DAGUERREOTYPE
W. M. Hollinger



COPIED FROM A DAGUERRETYPE
W. M. Hollinger

must use side rather than front lighting, but in such cases we stand between the devil and the deep sea, and reflection is a more glaring defect than the graininess liable to creep in with sideways illumination.

Plate and
Original
Parallel

In all copying the sensitive surface should be exactly parallel to the original. If not, a certain amount of distortion is introduced, i. e., lines which should be parallel in the copy appear inclined to each other. With a properly constructed copying board, we ought to be certain that the original will always be in this relation to the plate. If necessary it can be tested by the following method of Abney's: "On the center of the board on which the drawing, etc., is to be fastened a small mirror may be temporarily fixed. This latter should be strictly parallel to the surface of the board. The point corresponding to the center of the lens should be accurately marked on the ground-glass. On the lens itself an open cap should be fitted, furnished with two cross-threads, intersecting on the prolongation of the axis of the lens. The image of these cross-threads will be reflected by the mirror and should be focused. The board should then be tilted or slewed round until the image of their intersection coincides with the point marked on the ground-glass. The board will now be parallel to the ground-glass. The mirror may be let in flush with the board."

A simpler though less delicate test for parallelism is a short wooden cylinder fixed exactly at right angle to a small flat base-board. The cylinder is painted white, the board black. The base-board is placed against the picture being copied, and if the ground-glass is perfectly parallel to it the end of the cylinder will appear as a perfectly round disc thereon; otherwise it will appear more or less oval. This little device is very useful when copying pictures away from home with the camera on the tripod.

Another device for securing parallelism in copying is to set up the camera in front of the photograph or print to be copied, and adjust it with a spirit-level. Fix a compass to a square block of wood, bring one of the edges in contact with the object to be copied, and

note the exact position of the compass. Then apply the same edge of the block to the focusing screen, and turn the camera on the screen, so that the needle of the compass assumes the same position as before. Those who have worked with a prismatic compass for filling in the details of a survey will realize the accuracy obtainable by this very easy and rapid method of working, provided only that the compass is properly mounted, and that nothing magnetic disturbs the result. The horizontal adjustment having been made as described, the plumb-line or a vertical spirit-level is used to secure the necessary correspondence.

Sharp definition is a matter of course
Focusing in copying, and care must be taken that the register of the dark slide is correct, i. e., that the surface of the plate comes into the same position as that of the ground-glass. To test this, use the old method of laying a thin straight-edge (say a steel rule) across, first, the interior frame of the focusing screen, and secondly, the dark slide with shutter withdrawn and plate in position; a wedge-shaped strip of card is slid under the rule, and should stop at the same place in each case.

A magnifier is an immense help in rapidly getting a sharp focus, but few people know the correct way to use it. To simply focus until the image appears sharpest when viewed through it may give no better focus than the naked eye. A couple of hairs must be cemented to the ground side of the focusing screen, under a microscopic cover-glass, with Canada balsam. The magnifier is first adjusted to get these hairs in sharpest focus; and then, when focusing, the original, the hairs and the image must be viewed at the same time. The reason for this precaution is that the eye accommodates itself to perceive as sharp, objects which are not in the true focal plane, and the fine hair-lines prevent it from doing this. When focusing photographs which are not sharp, such as salon exhibits, one must press a sheet of printed matter against the picture as a guide to focusing. Without this aid one cannot be certain of getting the same amount of "unsharpness" as in the original.

**Line and
Full-tone**

We can now pass to the all-important questions of plate, exposure and development; and here it will be well to split these instructions into two distinct sections, viz., line and full-tone subjects, because the treatment which is good for one is very bad for the other. By line we mean any drawing, pen-and-ink sketch, wood-cut or proof from a photo-zinc block in which there are only two degrees of shade, black or white, or rather the black of the ink, which is often more like gray than black, and the white of the paper, which is similarly often impure. In copying these kinds of originals by the gelatine process, the tendency is to lessen rather than to strengthen the contrast between the black and white; whereas we scarcely ever want the copy to have less contrast than the original, but generally more. A full-tone original is one, such as a photograph, wash-drawing, water-color or other painting, in which there is every tone from black to white, and usually no sharp lines. With these the aim of the photographic copyist is to preserve the relative tones of the original i. e., to give a copy with no more or less contrast than in the picture. To carry out this aim to perfection requires some considerable skill, and a sense of tones of which many people, including "process" operators, appear to be entirely destitute.

Before pinning up old steel-engravings or prints to be copied, they should first of all be carefully dusted with a clean, soft duster, and then gone over with stale bread, using only the soft part of the bread and being careful not to injure the surface of the print. This will do much to remove the dust and smoke which will have gathered on them.

Newspaper illustrations of the pen-and-ink variety, such as those by Phil May and Reginald Cleaver—to take two diverse examples,—are often printed on thin and, to a certain extent, transparent paper, so that in the white spaces the drawings on the back of the paper show through. Pin the sheet of paper to be copied to a board faced with black velvet, and this difficulty will disappear, for everything being in black at the back no drawing can show through.

Line Drawings The best plate for line subjects is that known as a "photo-mechanical" or "process" plate, though it is too slow to conveniently use when copying by ordinary gaslight; but with a lens of fairly large aperture and incandescent gas exposures run into a few seconds only.

Next to the photo-mechanical is a richly coated slow ordinary plate which, suitably treated, will give the clear line and dense ground required in line negatives. A rapid or extra-rapid plate should not be used, as with it the fogging over of the lines is almost unavoidable, and in line negatives absolute clearness of the lines when the plate is laid film down on a piece of white paper is the first requirement. It is more important than great opacity of the ground.

Exposure I hesitate to give any definite idea as to exposure, but let the beginner take the following as a basis to work on: Copying line drawing same size, stop $f/16$ (i. e., $f/32$ really); slow photo-mechanical plate near window of ordinary room in good summer light, two minutes.

A very good method of testing the length of exposure which is applicable to all conditions is, after having placed the subject to be copied in a good light, to expose a preliminary test-plate by pushing in the shutter of the dark slide an inch at a time, carefully noting the various lengths of exposure, and then developing to see which exposure is the proper one.

For gaslight: Copying line drawing same size, stop $f/11$ (i. e., $f/22$ really); slow landscape plate; 2 Argand gas-burners each about four inches from easel, about one minute. But a practical test is preferable.

Developing Line Negatives Hydroquinone is usually recommended for the development of line negatives, but the silver deposit secured with pyro is more opaque and the negatives print better, to my thinking. However, as hydroquinone is practically stainless, I add the formula: (I) Hydroquinone, 40 grains; potass. bromide, 10 grains; potass. metabisulphite, 40 grains; distilled water to make 10 fluid ounces. (II) Caustic potash (stick), 80 grains; distilled water to make 10 fluid ounces. Use equal parts of I and II.

In this solution the plate must come up steadily, and without forcing, and development be complete in five or ten minutes. If the image is a long time in coming out and is slow in getting density, it is underexposed and may as well be thrown away at once. In developing, carefully watch the lines of the drawing, comparing them with the white edge of the plate where the rebate or spring of the plate-holder has protected it. It is most important to have the lines perfectly unfogged, and as soon as they show signs of clouding over the plate is removed and well rinsed. With hydroquinone there is more going back of density in fixing than with pyro, so that the plate may be taken a little further when using this formula.

It is a distinct advantage to give a longer washing between development and fixing than is usually done. Five or ten minutes' soaking and then a rinse under the tap is a help, I find, to clear lines; the reason being the perfect removal of the developer before the plate is transferred to a hypo bath containing dissolved silver, and therefore acting, with developer, as a physical intensifier.

After fixation, the plate should be clear and unstained with perfectly clear glass on the lines and good opacity on the ground or whites of the original. The test of this is to lay it, film down, on a piece of clean paper or hold it over a piece of black velvet, when no deposit over the lines should be visible. Suppose there is a slight veil over the lines, as is certain to be frequently the case; I will show how to remove this, but before doing so, several other formulæ for developers may be given with advantage.

Other Developers Glycin is an excellent developer for line subjects, but horribly slow. One must invest in a rocker and develop half a dozen negatives or so together in one dish. Formula: Glycin, 40 grains; soda sulphite (cryst.), 120 grains; potass. carbonate, 200 grains; water, 10 ounces, with a drop or so of potassium bromide (10-per cent solution) per ounce of developer.

Hydroquinone-formalin is a developer like glycin in its slowness. It gives clear lines and good density.

Formula: Hydroquinone, 45 grains; soda sulphite, 1 ounce; formalin, 45 minims; water 7 ounces. Potass. metabisulphite should not be used instead of sulphite in this solution.

A hydroquinone developer which I have found satisfactory with slow landscape plates is as follows: (I) Hydroquinone, 160 grains; soda sulphite, 4 ounces; citric acid, 60 grains; potass. bromide, 160 grains; water to make 20 ounces. (II) Caustic potash, 320 grains; water to make 20 ounces. Use equal parts of I and II. This solution acts quickly, and I have generally found it well to overdevelop and to clear the lines afterwards with reducer.

I would not have the reader believe that no developer but these will give the necessary pluck. Indeed I might quote many more formulæ, but must limit myself to saying that the desired result is obtained most easily with a well-restrained developer, in other words a "short factor" developer, other formulæ for which will be found in THE PHOTO-MINIATURE No. 34: *More About Development.*

Of the many reducers, two are especially suitable for removing the faint deposit of fog from the lines whilst leaving the ground comparatively untouched; viz., Farmer's mixture of ferricyanide and hypo, and Eder's mercuric iodide and cyanide. But the latter is so intensely poisonous that it must be used with great caution.

The best way to apply the Farmer's solution is by rubbing a tuft of absorbent cotton soaked therein over the negative. Add a few drops of ferricyanide solution to some clean, plain hypo bath (not acid fixer) until the mixture is of a rather deep lemon-yellow color; saturate some absorbent cotton in it, squeeze most of the liquid out again and rub over the negative. Used thus, not too wet, it clears away the fog from the surface, but scarcely touches the density of the ground. Do not keep it applied too long. After the first few seconds rinse under the tap, and if the lines are not now absolutely clear apply again, and so on. Too long an application causes yellow stain

Eder's reducer is: Mercuric chloride, 10 grains; potass. iodide, 10 grains; potass. cyanide, 20 grains; water, 10 ounces. Dissolve in this order. Immerse the plate in the solution, which reduces slowly.

If after either of these reducers the density of the blacks is not enough, i. e., if the dark parts do not appear entirely "choked up" when the negative is laid film down on white paper, we can intensify, but it is useless to do so unless the lines are clear gelatine without the vestige of a deposit.

I give several formulæ, all helping in the direction we require; viz., to build up the density of the ground whilst leaving the lines untouched. For each of them, the plate must be thoroughly washed—at least for one hour in five-minute changes—and should then receive a couple of soaks in distilled water.

(1) Bleach in the usual saturated solution of mercury bichloride; wash well first in two changes of distilled water, and then blacken in ammonia (20 drops 800° solution) per ounce, or in Schlippe's salt (10 to 20 grains per ounce) mixed just before use.

(2) Moncuhoven's intensifier. Prepare solutions: (A) Mercuric chloride, 100 grains; potass. bromide, 100 grains; water, 10 ounces. (B) Silver nitrate, 100 grains; water, 10 ounces. (C) Potass. cyanide, 100 grains; water, 1 ounce. Add C slowly to B, stirring until the precipitate first formed is nearly (but not quite) dissolved. Pour off from these remaining flakes and label "Blackening solution." Bleach the negative in A, wash well and treat with the blackening solution until the ground is blackened through to the glass. Now watch the action carefully. As soon as it is seen that the lines are bare gelatine, rinse off the liquid. The peculiar action of this intensifier is that the "blackening solution," if given time, undoes its own work. But as it commences on the clear parts first we can take advantage of this property to secure fogless lines with great density in other parts.

(3) The following gives very great intensification, but requires thoroughness of washing beforehand and at each stage. Lead nitrate, 20 grains; potass. ferri-

cyanide, 30 grains; acetic acid, 10 minims; water, 1 ounce. Bleach the negative in this and wash thoroughly, using nitric acid water (45 minims of acid per ounce of water) for the first one or two changes. This makes the film very tender, so handle carefully. After washing, bleach in ammonium sulphide (ordinary ammonium sulphide liquor as supplied, diluted with ten or twenty parts of water). Again treat with two baths of the nitric acid water, and thoroughly wash.

By these processes we obtain a negative which as nearly resembles a stencil cut in metal as we can produce by the gelatine process.

Faint pencil sketches come out unduly flat on gelatine plates, and in order to get enough contrast the drawing should be covered with a piece of yellowish green glass or a film of gelatine of the same color.

Drawings in colored lines present no difficulty unless the color is a faint blue, in which case an iso. plate and a deep yellow screen are absolutely necessary. In place of a yellow screen, gas or other light filtered through yellow glass or tissue paper answers just as well,—which plan is a suggestion of Abney's.

Reproducing
Engravings
Without a
Camera

Where it is desired to copy an illustration from a book which cannot be photographed in the ordinary way, the following plan suggested by F. Jervis Smith may be found useful: "In certain libraries," writes he, "there exists a fixed rule that no books may be removed. This being so, all extracts and copies of plates and engravings have to be made in the libraries. Reproduction by the methods of ordinary photography is most inconvenient, since the employment of artificial light is strictly prohibited; also the introduction of a camera, and its manipulation in a library, are surrounded by many difficulties. These circumstances led me to devise the following method for obtaining copies of plates, engravings, printing and writings: A piece of cardboard is coated with a phosphorescent substance, and, after sufficient exposure to the light of the sun or of an arc lamp, it is placed at the back of the engraving or writing to be



COPIED FROM A DAGUERREOTYPE
W. M. Hollinger



TUBEROSES
F. Mason Good

copied; on the face of the engraving or writing a dry photographic plate is placed, and then the book is closed for a certain time, depending on the nature and thickness of the paper used in the book. I find that the period of time lies between eighteen and sixty minutes. The plate is then withdrawn and stored in a dark box for development. The dry plate is easily manipulated under a cloth, which shuts off all light and covers the book during the operation. The results are sufficiently good for most purposes—in the case of some papers the fibrous structure is shown; this very slightly detracts from the clearness of the copies made by this process. Neither the luminous substance nor the dry plate injure the book in any way, so that the method may be employed in the case of valuable prints and engravings. If films be used instead of plates, a large number of copies of different engravings in the same book may be made at the same time." He points out that when it is possible to place the phosphorescent card on a warm surface the time of exposure to it may be greatly reduced. We should think that for certain purposes this plan, which is characterized by extreme simplicity, would be of considerable use.

Now I come to the reproduction of pictures consisting not of black lines on a white ground, but of various shades from black to white. In some cases, as in copying the work of a print claiming to be "a pictorial photograph," it is very important to produce exactly the same relation between the tones in our copy as between those of the original. In others, *e. g.*, a flat print, we may want to make the whites whiter and the blacks blacker in the copy than in the original—in other words, to make a pluckier copy. In other cases, of a hard or chalky print, we require to tone down the lights and weaken the blacks of the shadows. All these we can do by suitably modifying our exposure and development.

Although a photo-mechanical plate is just as suitable for full-tone copying as for line, I recommend an ordinary plate of medium rapidity, because it is less easy to underexpose, and underexposure is the bane of this kind of

copy. Full exposure with restrained development is the golden rule, because, as we shall see later, when talking about grain, its cause and prevention, under-exposure has as much to do with this defect as bad prints or improper lighting. Suppose we have a photograph fixed to our easel-board for copying same size, and we want a reproduction as near as possible facsimile.

Our first aim is to ascertain the correct

Exposure exposure as nearly as we can, and to err, if at all, on the side of overexposure.

An actinometer, such as Watkins' or Wynne's is of great practical use here. It is placed against the easel so that it receives exactly the same light as the original, and, from the time of darkening, the exposure worked out for the stop as marked on the mount. The increase of exposure necessitated by the extra extension of the camera is calculated by either of the rules already given. For same-size work it is four times the actinometer figure. For enlargement it is more than four; for reduction, less.

Lastly, there is the color of the original, and for this we can only allow by practice. The warmer the color the longer the exposure on ordinary plates. The same is true, but in a lesser degree, for iso. plates. The print copying most rapidly is one on gelatine or collodion, slightly over-toned to a blush tint. The warmer tones with gold or platinum require much longer, and sepia-platinum and gum or carbon prints of vivid hues still longer. It is not possible to name the relative times because plate and light enter in. The more sensitive the plate to yellow, green and red the less the increase. Similarly the richer the light in these days the less the exposure for colored objects compared with those of cold tone.

The best guide to exposure is the

Development development of the plate. All details, even in the deepest shadows, should come up readily, and the appearance of the plate as a whole should be soft in the early stage of development. Any contrast required can be obtained by continuing development.

The two dangers in copying half-tone subjects of

whatever kind are underexposure and the use of too strong a developer, to commence with. Both have the effect of producing a "hard" or "chalky" copy, which may be an advantage in some cases but is fatal when copying for a facsimile effect. The developer itself does not matter so much, though personally I prefer hydroquinone, as it gives no stain and enables us to get vigor or hardness when we want these. The following formula, due to W. Ethelbert Henry, is excellent: *A*, Hydroquinone, 160 grains; citric acid, 60 grains; potass. bromide, 30 grains; soda sulphite, 2 ounces; alcohol, 1 ounce; water, to make 20 ounces. Dissolve the citric acid, bromide and sulphite together in about fourteen ounces of water; dissolve the hydroquinone in the alcohol and then add it gradually to the other solution with frequent shaking; finally add the rest of the water. *B*, Potass. carbonate, 3 ounces; sodium carbonate, 3 ounces; water, 20 ounces. *C*, Potass. bromide, 1 ounce; water to 10 ounces. Commence development with *A*, 1 ounce; *B*, 1 ounce; water 3 to 4 ounces. When all details have appeared and the negative is seen to want merely a little vigor to give brilliancy to the high lights, replace the solution by: *A*, 1 ounce; *B*, 1 ounce; *C*, 40 drops.

Never use hydroquinone with caustic soda or potash for half-tones where you want fine gradation.

Flat A poor washed-out print can be re-
Half-tones produced in much improved form by taking advantage of this very defect of hydroquinone *plus* caustic alkali. Here we cast facsimile tone values to the winds, our sole object being to make a "bright" copy. Prepare a fourth solution *D*, as follows: Caustic soda (stick), 160 grains; water, 20 ounces. Be careful not to overexpose, and develop with: *A*, 1 ounce; *D*, 1 ounce; *C*, 40 to 80 drops. If the negative does not look bright enough, rub over with Farmer's reducer as already directed and intensify with mercury and ammonia.

Chalky Prints, such as are produced by the
Half-tones thousand in hand-cameras, with heavy detailless shadows and white skies and roads, require different treatment in copying in order

to reduce their excessive contrasts. Expose for rather longer than usual and develop with the solution given above for facsimile work but using the weak developer throughout. You will find that in the print from the resulting negative the errors made in developing the original negative are largely corrected. The false results of under exposure it is impossible to amend, but we can reach the softer result which would have resulted from a weak developer in the first instance.

Copying Distorted Prints Photographs with the familiar "drunken" effect, caused by tilting the camera without swinging the back, can be restored to correct proportions by copying with the plate at an inclination to the lens. Learned authorities have elaborated the operation to a point of trigonometrical finesse, but one needs no "cosine O" to photograph the print. Tilt the swing back until the lines are parallel and stop down to get sharp definition.

Where the converging of the lines is very great, it is best to make a transparency and to copy this in the camera, tilting it towards the inclined sensitive plate until the desired correction is obtained. The less the focal length of the lens used for this work the better, as less tilting is required.

Grain This trouble besets the path of the beginner in copying, who cannot understand how his productions acquire a coarse sackcloth-like appearance. Now grain will not appear in the copy unless it exists in the print, but, if wrongly done, copying enormously exaggerates the grain. The causes which lead to this are side-way lighting, underexposure and forced development.

The surface of any unglazed paper What is Grain? (and to a much lesser degree of glazed papers also) consists of an immense number of projections, or tiny "mole-hills." Now, if we illuminate the print from the one side, the tops and the near sides of the hills are lighted but the off sides are cast in shadow. We must use a flat lighting to secure equal illumination, or if we cannot place our light directly in front we must use a reflector to illuminate the off sides of the tiny hills. Thus we see how lighting

exaggerates grain. Underexposure does so also, because all the well-lighted tops of the hills develop more strongly than the less-lighted shadow sides, and we get the picture broken up into grain, which grain is more pronounced or harder with under exposure just as any underexposed negative is. Lastly, development which has to be unduly prolonged (i. e., forced) usually causes this exaggerated grain to appear.

To Avoid Grain

The above indicates the preventives of grain, but one or two other hints are helpful for subjects in which the grain trouble is more acute than in others. Engravings, or rough prints (especially when old and rubbed) and albumen prints (with the albumen coating cracked all over) are examples. The best plan is to cover the whole space between camera and picture with thin tissue paper. Cracked albumen prints are rubbed over with glycerine, squeezed to glass, and so photographed with a tissue-paper screen around to keep out reflections. Encaustic paste rubbed over prints is a help. Formula: Gum elemi, 1 part; white wax, 8 parts; oil of lavender, 6 parts. Melt the wax and gum in gentle heat, and add the oil with constant stirring until cold. Another plan is: Focus sharply and expose for about half the necessary time; then rack the plate (not the lens) slightly out of focus beyond the focal plane; give a brief exposure, rack slightly forward of the focal plane and again expose.

Seals and Documents

Ancient documents. A photo-mechanical plate is best as suggested by Harold Baker, who adds the following very practical note: "When ancient deeds have to be copied with red seals attached, the exposure necessary for the non-actinic seal is far too long for the document, and some method is necessary to keep back the exposure of the parchment. A good method is to pin the deed on a board and cover the whole with a piece of black paper, having a hole in it just the size of the seal. I have given as much as an hour to the seal before exposing for the document. The black paper is taken away when the seal has received sufficient exposure and a comparatively short exposure given to the parch-

ment. While the paper is being removed the lens must not be capped, as the camera may be moved, but a black hat or cap may be held over the lens without touching it. Brown paper answers as well as black for masking the parchment. Documents having dark brown stains upon them may be copied in a similar manner by tearing holes in a piece of brown paper to correspond with the stains. The paper is then pinned over the deed so that the stains are uncovered. By this means the writing covered by the stains can be deciphered in the negative. When it is estimated that the stained parts have had sufficient exposure, the lens is covered, the brown paper is removed and a normal exposure given for the rest of the document."

Albumen and collodion and gelatine
Faded Prints prints, the grounds of which have become yellow with age, can be restored by immersing in a weak solution of mercuric chloride (8 grains) in water (40 ounces) *plus* hydrochloric acid (8 drops) until the yellow tinge is completely removed from the ground, thoroughly washing and immersing in a solution of double chloride of gold and potassium (4 grains) in water (10 ounces); but where the print may not be touched the best plan is to photograph onto an ordinary plate through a blue screen. The glass-vendors supply a suitable glass, and the print is placed behind it. Or, working with artificial light, the print can be illuminated by the blue light coming from incandescent gas-burners behind the blue glass.

The advantage of the blue filter over the use of iso. plates is especially noticeable in copying faded vignettes. If the iso. plate is sufficiently sensitive to yellow to give a good white background it is also sensitive to the yellow stain which exists also in the darker parts of the picture, which latter therefore is rendered more feeble than is the case with the blue screen.

But it often happens that a very old
 Preparing and faded photograph gives a better
 the Prints result than might be anticipated without
 any attempt to restore the color. The yellowness, on an ordinary plate, helps to make the result more vigorous than the original image.

Very much can be done, however, in many cases, to improve an old photograph, either on the print before it is copied, on the negative by retouching after it is made, or on the resultant print. Indeed it may need all one can do in every way to get the best result. In the case of a faded old photograph, say a vignette of head and shoulders in which some of the outlines are lost, the print should have the faded outlines gently drawn in, i. e., delicately and with soft color, so far as the formation can be discerned from what is left of it; but it is better to leave any lost features vague and indistinct and to the imagination, than attempt to define sharply what would perhaps still suggest likeness if left untouched.

There is more latitude, however, in the dress, and even the hair may be softly outlined and shaded in; but it must be done with very soft color toned to the exact color of the print. There must be no hard lines, or the copy will appear crude; the work must be soft and in general harmony with the character of the print. Any tone of color for silver or platinotype prints may be made by mixing lamp-black and sepia in water. A small brush—a No. 2 sable—would be the best to use. The negative made from this print should be a fairly strong one, with every bit of detail got out.

In retouching nothing in the character of the face should be taken out; the lines should be left as they are in the original, and nothing done but spotting out of holes and imperfections. The high lights might, however, be slightly intensified with the pencil in order to produce a little more contrast in the printing quality of the negative, or mineral paper could be pasted over the back of the negative which could be worked on with chalk to produce a broader effect in the same direction. Another way to produce greater contrast is to cover the back of the negative with ground-glass varnish, and when dry, scrape away with a small knife the portions covering the parts of the picture which are wanted to print dark. This is a very good and effectual way of obtaining greater contrast. And the ground-glass varnish being "toothy," chalk may also be used in intensifying the high lights of the picture.

Having prepared the negative for printing as carefully as possible, the question now is the sort of process in which it would come out best. Platinotype is a very convenient and helpful sort of printing surface, as the paper being porous and like drawing paper, so much work can be done on the print afterwards. It may be thought by some workers that it gives prints rather too low in tone, for copies and flat subjects, in which all the help in brilliancy is wanted that can be got; but after a long experience I have found that where a good deal of work is necessary to be done on the print in order to make the copy pleasing and satisfactory, platinotype is by far the best and most suitable. Much of the success of the copy will depend upon the finishing, for whatever work may have been done on the print before it was copied, or on the negative before printing, will require to be blended and softened in with the brush. There are limitless possibilities here, but it is work requiring skill and practice. The subject was treated in *THE PHOTO-MINIATURE* No. 12: *Retouching Negatives and Prints*, and therefore nothing further need be said about it here.

Copying Figures from a Group

Very often it is desired for one portrait in a group to be vignettied out. Probably other figures on either side and above impinge on the shoulders and come behind the head. Try first of all a cut-out paper mask over the figure to be copied, to show how much or how little it were desirable to take in. Having settled this point, study the picture to find out whether it were best to take out what is not wanted on the print before it is copied or on the negative afterwards.

There is an old accepted theory that with body color it is best to paint out on the print the figures in the background, keeping the work fine, close round the head and shoulders. This is certainly a rough-and-ready method which many adopt, but in practice I have not found it to give the best result. I am very much inclined to do all that possibly can be done on the negative. This leaves the original print unharmed, and it can be used as a guide in all future manipulations.

Of course the drawing in of shoulders that are partly

hidden necessitates a certain knowledge of drawing and anatomy. If the photograph is copied without any painting out of impinging objects on the print, then the whole of the work must be done on the negative. The best way is to outline the shoulders on the back of the negative with chrome-yellow (mixed with water to the consistency of cream), and with brush and pencil and knife, fill in and scrape away whatever would print too dark or too light, until the shoulders stand out clear and well defined. The same with the background; anything can be done. It means a great deal of careful work, but it is a better way than simply blocking out with body color on the original print before copying. Besides, blocking out does not fill in the shoulders. True, they could be drawn in on the platinotype print, but when more than one print is wanted it is best to have done the work once for all, and to have only the finishing off to do on the prints. Another thing: I have always noticed that when body color is used to block out on the print, it seems to absorb too much of the silver in the plate, so much so that the face, which is the main consideration, comes thin and prints too dark. There is more harmony in the effect of the whole when the work is done on the negative rather than on the prints.

Introducing
New Features

Then it is also possible to introduce objects into photographs. I have in my mind the case of a photograph of a man taken with two orders of merit on his breast. The man died; but after the photograph was taken two more orders had been conferred upon him. The family wanted these two new orders to be introduced into the photograph. To effect this work, all four orders were pinned onto a man's breast in the position which the two already in the photograph had been worn and the two new ones were to occupy. The lighting was arranged the same way as in the photograph, the size was also the same precisely, and exposure was made. The negative was developed and printed, and the two medals were drawn into the original negative by the use of knife and brush and pencil most successfully. Another case I remember is

of a man who was photographed with his hat on and with it off, but with the contrariness of fate the photograph taken with the hat on proved the more pleasing likeness of the two. This was not satisfactory to the family, who wanted the nicer portrait but without the hat. It was therefore a problem as to how the change could be effected, as the gentleman was dead. Other photographs had been taken of him at an earlier period, some of which were similar in pose and lighting to the one taken in the hat. With the help of these the picture was entirely transformed.

To begin with, an enlarged negative was made of the hat picture, and also one of the earlier photographs, nearest to the hat one in point of position of head and lighting—both to small life-size. They were printed; and on the print of the hat photograph the hat was painted out with white body-color entirely, and on the white ground the top of head as shown in the other enlarged photograph without hat was drawn in, the rest of the white being turned into background. The whole was then re-photographed the same size, and the print, which was done in sepia platinotype, was then finished in sepia chalk. The picture was a perfect success and had the appearance of a beautiful mezzotint engraving. There was absolutely no trace whatsoever of any alteration having been made.

The copying of daguerreotypes offers a test of skill worthy of the enthusiastic copyist at his best. Much has been written about the subject, special stress being laid upon the necessity of "cleaning" or restoring daguerreotypes before their reproduction. As this is not invariably necessary, my first word will be a word of caution. The Daguerrean image, although in a sense absolutely permanent, is extremely delicate in structure, and may most easily be destroyed by an incautious touch. As a rule the Daguerrean artist did his work well, and if the original to be copied shows no signs of tarnish, it will be well to set about its reproduction without any attempt at restoration. If the surface under the glass cover in the little case shows dust, remove the glass and carefully clean it. Any dust on the surface of the pic-

ture image itself may be removed by very lightly passing a soft camel's-hair brush over it. On no account must the surface be touched with the fingers or the most delicate material, or the delicate film will be injured. Mr. W. M. Hollinger, some of whose clever copies of daguerreotypes illustrate this monograph, tells me that very rarely indeed does he in any way attempt the renovation of the originals sent him for reproduction. This is weighty counsel, since few men have been so wonderfully successful in this particular field.

If the entire surface has become darkened or tarnished by the influence of the air upon the film, some restoration is of course essential to the best results. To effect this, remove the silvered plate from the case and place it, image uppermost, under a box lid or other protector from dust, etc. Now put a small piece of potassium cyanide (deadly poison) into a graduate, and pour over it an ounce or two ounces of water. Holding the daguerreotype by the corner with a pair of pliers, rinse it in clear running water; then pour over it the weak cyanide solution (a 3-per cent solution is usually employed), and return it to the graduate. Repeat this operation several times until the discoloration quite disappears. Within a few minutes the daguerreotype will appear as fresh and as brilliant as when first made. Wash well in running water, and then, before the surplus water has time to collect in tears upon the image, begin to dry the plate gradually over a spirit lamp, holding the plate in an inclined position so that it will dry from the uppermost corner. The plate must not be held too long over the flame or the thin silver film may separate from its copper support. The secret of success is in the use of pure water for the final washings, and the drying of the image without check or the formation of tears. The picture should now be restored to its case, and the edges secured with goldbeater's skin or gummed paper to thoroughly exclude the air.

In copying daguerreotypes in their cases it is usually advisable to turn them on one side. If fixed to an open board or support, reflections will undoubtedly give trouble,

and these are not always visible on the ground-glass. It is therefore usual to copy daguerreotypes placed at the end of a fairly deep box lined with velvet, the lens being pointed at the picture through a hole cut in a black cloth flap which covers the front end of the box. Light is admitted through openings at the side of the box. The exposure is necessarily protracted. Care must be taken to avoid movement during the exposure. If the marks of the buffer—fine horizontal lines—are seen in the resulting negative, the plate should be placed vertically and rephotographed when these lines will usually disappear.

In explaining the poor quality of the
Hints average copy of a daguerreotype, as
 produced in many studios, Mr. Hollinger informs me that this is probably due to two causes: First, daguerreotypes sent in to be copied are usually allowed to accumulate with other copying orders until the photographer or his assistant can devote a dull day to the work. They are then "put through in a bunch" without much individual consideration. Mr. Hollinger avers that the daguerreotype deserves just as much consideration as the living sitter, and he therefore takes each one separately as part of the day's work, giving it place among the regular sittings of the day. By this plan the original gets the care and attention it needs, and the results amply justify this common-sense treatment. The second error made by the professional is his slavish adherence to the old rule concerning "copies" in general, viz., "Avoid hardness, and get all possible detail." In other words, "expose for the shadows and let the high lights take care of themselves." This, in copying daguerreotypes, can only result in flatness and gray shadows—the things to avoid. Mr. Hollinger, in his practice, gives a generous exposure, and in development keeps his attention on the high lights, letting the shadows come as they will. In this way he secures the strongest high lights in development, making after-manipulation of the negative unnecessary as far as crispness and brilliancy are concerned. It necessarily follows that he secures rich shadows with all the details desirable therein. In this way he obtains

negatives requiring very little hand-work before printing, and vigorous copies without harshness, usually more pleasing than the originals from which they were made. Some of these desirable qualities are to be seen in our illustrations, although they necessarily fall far short of Mr. Hollinger's prints. The reproduction of the portrait of Bismarck is noteworthy from this point of view. We see the faded original in the lower corner of the passe-partout, and above the Hollinger copy, an untouched print from the "copy" negative.

There is another point to be mentioned. Clever as the Daguerrean artist undoubtedly was he did not understand the art of spacing. In copying his productions, therefore, it is often possible to improve upon his work by careful attention to the trimming (or shaping) of the copy. If shaped according to our modern methods, as seen in some of the Hollinger reproductions, the artistic value of the daguerreotype portrait may often be enhanced and effect wonderfully improved.

It is a big jump from the aristocratic "Tintypes" daguerreotype to the humble tintype or ferrotype portrait. Yet it will sometimes happen that the most precious record we possess is a portrait of this class. In treating these the repellent collodion surface may offer difficulties. After carefully rinsing in clean water, and as carefully drying the surface, flow a thin wash of gum water over the image and let this dry. Now with a fine brush and a little gray or white color, gently touch the features or other points which lack brightness. The eyes, lips, curves of the hair may sometimes be helped in this way, but the work requires more discrimination than paint. A few minutes' skilful work, however, will add force to the image or take out an objectionable background or undesirable figure.

Ambrotype portraits, or positives on glass, may be handled in a similar way with advantage. Where the black varnish usually employed with these to give desirable depth to the image has become worn it may be renewed by a coating of Bates's black varnish. It is not advis-

able to attempt to remove the old varnish as some photographers used to varnish over the film side of the image to obviate its reversal. When ambrotypes are simply backed with black velvet, this may be removed and a print obtained from the ambrotype itself (it is simply a weak negative). If platinotype paper be used an exposure of 18 to 22 seconds diffused daylight will usually suffice. Where the ambrotype is made on a dark purplish red glass, as was sometimes done, the time of printing will of course be prolonged.

With the ambrotype in its positive condition, as with the tintype, the method of copying advised for daguerreotypes on the preceding pages will be found productive of the best results.

For copying strongly colored objects

Paintings an orthochromatic plate and a screen suited to it are absolutely necessary, and one is of little use without the other. The reason for the screen is that no plate can yet be made as sensitive to green and red as to blue, so that a filter is necessary to cut out a certain proportion of blue light. The screen must, therefore, match the plate. One screen cannot be used at random with different brands of color-sensitive plates. Let the reader consult THE PHOTO-MINIATURE NO. 6: *Orthochromatic Photography* for further notes on the why and wherefore of this subject.

The ordinary iso. plate is sensitive to green and yellow, but for photographing deep-colored oil paintings we must have a plate which is sensitive to red as well. We can purchase such panchromatic plates ready for use. The brands are: Seed's L Ortho. plate with the chromatic curve-corrector filter, Carbutt's Polychromatic plate, the Cramer Slow Iso. and Orthonon; the Lumière "C," the Cadett Spectrum, and the "Rainbow," these last three being suggested for British readers. Filters properly adjusted to the plates are sold by the makers, and these should be procured.

The home color-sensitizing of ordinary plates by bathing is not a very difficult matter, but seldom necessary or practiced. Many professional copyists of paintings

Bathing
Plates

prepare their plates in this way. Some indeed bathe an iso. plate, and judging from the patent specification of a German firm recently published there is an advantage in incorporating the dyes with the gelatine separately rather than all together. Of bathing formulæ, one by Dr. Meithe is very satisfactory. Prepare as stock solutions: *A*, Erythrosin 35 grains; alcohol (96 per cent), 40 fluid ounces. *B*, Cyanin, 35 grains; alcohol, 40 fluid ounces. To prepare the bath take: Alcohol (96 per cent), 25 ounces; *B* solution, $\frac{1}{2}$ ounce; water, 100 ounces; *A* solution, $6\frac{1}{4}$ ounces. Stir the cyanin solution thoroughly with the alcohol and add the water gradually. Filter the whole before use. If the filter-paper becomes strongly blue, part of the cyanin has been precipitated by too-rapid addition of the water; or the sample requires more alcohol than in the formula. Just before use four drops of strong ammonia are added per fluid ounce. The plates are bathed for two minutes (without preliminary soaking), washed for five or six minutes in running water and dried in a properly ventilated box—all in perfect darkness. They will keep for at least three months. The filter for use with them is made by coating glass plates with a gelatine solution containing tartrazin (10 parts) and "genuine red," i. e., "echtes rot" (1 to $1\frac{1}{2}$ parts). These dyes are made by Friedr. Bager & Co., Elberfeld, Germany, and are obtainable from large chemical dealers in New York, and in England from Mawson & Swan. The exact amount to be added to the gelatine solution must be found by trial by photographing a colored test-object. The exposure with plates so prepared is from thirty to forty times that required by ordinary plates without a screen.

The more highly colored the picture, the deeper the screen is needed to be. For light-colored subjects, a pure yellow screen suffices, of which there are many on the market. In making one tartrazin alone is used.

The best of all lights for copying oil paintings is direct sunlight, the next best according to such authorities as John Carbutt and E. J. Wall, are magnesium, gas-light and diffused daylight. Artificial light is only pos-

sible for small pictures, but there is the advantage that by means of a reflector or a filter we can get the same effect as with a screen before the lens. This plan is due to Abney who uses gas-light reflected from an orange-colored concave reflector made of paper; the reflecting surface being covered with orange chrome. The light is placed at a distance equal to half the radius of the sphere of which the reflector is formed, and direct light may be cut out by an opaque screen. Or a light, such as magnesium or incandescent gas, may be filtered through canary glass, the picture being arranged between the two lamps.

The direction of illumination is, however, a moot point. One rule is to let the light come from the direction in which the light has been supposed to come in the picture itself. This is based on the assumption that the picture is painted to give the best effect when viewed in this way and that, even if brush-marks, etc., show up in the copy, the result is likely to please the artist. The public, however, will probably prefer a reproduction with even illumination.

A golden rule in copying all colored subjects is that it is easy to give too little and difficult to give too much. The exposure for an oil painting through a screen may run into hours, but may still be underexposed.

Don't tamper with an old oil painting unless you are certain it is oil. Distemper looks very much like it, but is ruined by watery liquids. In any case it is best to let the brightening up of old paintings be done by an expert, who will probably sponge with glycerine and water, mixed with a little ox-gall to make the liquid "take" to the greasy surface.

The following résumé of the methods advised an expert, E. Sanger Shepherd, may be republished here with advantage; The lens should be one giving a flat field, with good definition. Zeiss Planar, Cooke, and Ross Portable Symmetrical are all worthy of attention.

Focusing.—It is a help to have the focusing screen ruled with a few lines parallel to its margins, also two

lines joining the middle points of opposite sides, and a concentric circle or two. These help in getting the image square and true on the screen.

Lighting the Picture.—This is of importance. For light and brightly colored pictures, ordinary water-colors, diffused daylight is good. But if the pictures be very dark, old and brown, or are old oil-paintings, direct daylight will often enable one to get out details which no other light will give. If artificial (lamp) light be used, then it is best to place the light one on each side of the painting and fairly close to it. The ordinary plan of placing the light one on each side of and close to the camera often gave very objectionable reflections.

Preparation of Color-screens.—Two convenient methods are open to us. First, when the dye is soluble in water, prepare a solution of suitable strength: Then fix an ordinary dry plate in hypo until all the silver is entirely removed and only a layer of clear gelatine remains on the glass. Then wash in water thoroughly and immerse for five, ten, fifteen, etc., minutes in the dye solution. Quickly rinse and dry. By altering the strength of the dye solution, and the time the gelatin plate is in this solution, we can obtain light or dark screens. Secondly, when the dye is not soluble in water but is soluble in spirits: It may then be so dissolved and added to plain collodion. The white glass screen is then coated with the colored collodion.

Developers.—With hydroquinone and developers of this kind the blues first come out, then the greens, and finally the reds. A plate may require ten, twenty or thirty minutes for development. Hence, if underdeveloped, the reds may be quite unrepresented. But with metol and other light developers we get out the whole image at once, and density is gradually built up. Hence for work of this kind metol will be found a useful and exceedingly satisfactory developer and can be well recommended.

Dark-room Light.—The light for any brand of plate should be adjusted to that plate. What may be practically a safe light with one plate will probably fog some other brand. The particular tint or color for any

plate should permit only that color to pass through which does not seriously affect the plate. This can only be ascertained by photographing the spectrum with the plate, and so discovering in what region it is least sensitive. Some plates may be safely developed in a suitable green light, others in red light, and so on. A very good screen passing only a very deep red quite at the end of the visible spectrum may be prepared as follows: A gelatine plate is fixed and washed and dyed in aurantia. A second similar plate is dyed in naphthol yellow. (Both these dyes are soluble in water.) The dyed plates are quickly rinsed, dried and bound film to film. Collodion is now prepared, containing methyl-violet 6B (this is a spirit-soluble dye), and flowed over one of the glass sides of the dyed pair of plates. One point should be kept in mind; viz., that the quality of sun, electric, gas, oil lights varies, and therefore having selected some of these, say gas-light, for illuminating the picture to be copied, we must use the same kind of light for testing the color-sensitiveness of the plate, and adjust the color-screen accordingly. The underlying idea in the employment of a color-screen or filter is to keep back the rays of a certain part of the spectrum and so allow the less active colors to act. In fact, a color-screen acts like weighting a competitor in a race.

Plates which are sensitive to all parts of the spectrum must be prepared and developed in total darkness as they are very easily fogged.

Coins and Medals The best results are obtained not from the coins themselves but from plaster of Paris casts of them tinted with a little brown umber. The casts are made as follows: Warm the coin or medal and wipe it over with a tuft of cotton wool charged with vaseline, dabbing afterwards with a large camel's-hair brush so that the vaseline gets into every crevice but no perceptible grease remains on the surface. Place in a pill-box and cover over until the plaster is poured in. Add plaster of Paris to an ounce or so of water until the mixture is about as thick as cream, and at once pour a little over the coin and work it over the surface with a camel's-hair

brush to remove air-bells. Fill up the pill-box with the plaster. Remove the brush and leave the plaster to set. By removing the bottom of the box the coin is dislodged with a needle applied to its edge. When this mold is quite dry make a cast from it as follows: Make it quite hot and brush over with stearine on a small bristle brush. Mix up plaster as before but adding a little fine umber and pour it into the waxed mold. As soon as set it can be removed; if it sticks slightly warm the mold, when the cast can be slipped out. The casts present no difficulty in photography and give the most perfect reproductions of the original objects which can be made.

To obtain the obverse and reverse of one or several coins on the same negative, cut a thin piece of wood with a number of circular holes in it and cover one side with gray cloth or paper, removing the material from the holes. Glue the other side and lay a piece of black velvet or plush thereon, "right" side down. Stiffen this velvet backing by gluing a piece of card to it. The coins are placed obverse sides outward in alternate holes, photographed, each then placed reverse side outward in the vacant hole alongside each and the plate again exposed as before.

Gentle reader, we must make an end
Between Our- to our excursion, since the way itself
selves appears to have no end. Doubtless
much more has been missed out than included in my
all too brief and all too lengthy handling of the subject.
A word in conclusion about the right to copy may help
the over-zealous to avoid trouble. Many desirable
subjects—paintings, copies of paintings, engravings in
magazines, books and prints, photographs and drawings
are protected by copyright. To reproduce such sub-
jects is to run grave risks regardless of the intention or
spirit in which the reproduction is made. In America
all copyrighted subjects are so marked and are easily
recognized as forbidden fruit. In European countries
this detail is not essential, so that it is impossible to tell
whether this or that is protected or not without search-
ing the copyright registers of the country in question.
Ignorance of the law does not excuse its infringement.

Acknowledg-
ment In the preparation of what is here written I have to acknowledge the generous assistance of Mr. George E. Brown and Miss M. Phillis Bell. Mr. W. M. Hollinger also has my appreciative thanks for the illustrations, which so vividly recall the work of earlier days.

BOOKS

As there are no books directly bearing upon copying methods, I cannot do better than refer the student to works which may possibly help him to the improvement of his "copy" negatives, which are often abnormal in their character and, therefore, open to modification. Of these, the best are :

How to Improve Bad Negatives. By E. W. Newcomb. 65 pp. 1902. Cloth, \$1.50.

Finishing the Negative. By various writers. Edited by George E. Brown. 1902. (English.) 165 pp. \$1.25.

Retouching and Finishing Negatives and Prints. By R. E. Johnson. 1901. (English.) \$1.

NOTES

The annual convention of the Photographers' Association of America is usually the principal photographic event of the summer, and this year's meeting, held at Buffalo, N. Y., August 5 to 8, was no exception to the rule. We have attended many conventions but cannot recall one quite as satisfactory, from every point of view, as the one under notice. Buffalo is admirably adapted for convention purposes, and this, with its nearness to Niagara Falls and the Great Lakes, brought a large attendance of professional photographers. The displays made by manufacturers and dealers were unusually attractive. The exhibition of professional work was one worth going far to see, despite quite a few "horrible examples." The lectures were uncommonly helpful, the address given by Elbert Hubbard, of the *Philistine* magazine, being peculiarly pointed and practical. The professional photographer is slow to appreciate the fact that it pays best to do what is most worth while, and Mr. Hubbard devoted his talk to the exposition of this fact.

The convention was presided over by Mr. George M. Edmondson, of Cleveland, who was ably supported by Vice-Presidents J. G. Nussbaumer, H. S. Klein, Treasurer Barrows and Secretary Reeves. The convention of 1903 is to be held at Indianapolis, the location being determined by vote after a masterly argument in favor of San Francisco, by Carl E. Ackerman, editor of *Camera Craft*.

Socially the convention was a happy affair, and there were innumerable little dinners and confabs, to tell about which would require a whole number of THE PHOTO-MINIATURE. The scribe offers his sincere congratulations to the Photographers' Association of America upon its able leaders and the remarkable balance in its treasury.

The convention souvenir of the Photographers' Association of America deserves mention as the most creditable piece of work of its sort we have seen. It is a book of one hundred pages, six by nine and one-half inches, printed on deckel-edged laid linen of soft color, and enclosed within a tasteful gray cover, illumined with a Lytrite portrait, by J. C. Strauss, of St. Louis. Numerous photogravures add further attractiveness to the volume, which contains the programme of the convention, the constitution and laws of the association, and a list of its members.



It is interesting to note that Andrew Carnegie has recently presented to six British public libraries sets of stereoscopic views representing America, Italy, Egypt and other parts of the world. These sets are to be exchanged annually by the libraries possessing them, and the collections will be enlarged from time to time. With support of this sort there should no longer be any delay in the long-hoped-for revival of interest in stereoscopy.



We so frequently come across "whoppers" labeled "Made in America" in the pages of our British exchanges that we gladly make room to reprint the subjoined true story from the pages of *Photography*.

"The use of photographs for the illustrating of stories, etc., is gaining ground in America, not so much in the quantity used as in the appropriateness of their use. We have for years been used to photographic illustrations of this class in our home press, but the idea has been carried out just to the extent of using two or three stiff and untrained models, and the results have always savoured of parsimony rather than of success. In the *Saturday Evening Post* of Philadelphia, a recent article on "Fishing" by Ex-President Cleveland was charmingly illustrated by Miss Ben Yusuf with photographs of the burly writer engaged in his favorite hobby on the banks of a favorite stream. The same paper frequently illustrates short stories by means of the camera, and the names of the photographers and the

soundness of their work suggest that this is not done in any halfpenny policy of saving money. As much, probably, has been paid for these photographs as would have been for wash-drawings; and the choice of the camera over the brush has been made solely with a view to selecting the most suitable medium. Photography has long been too much associated with the idea of necessary cheapness, and it is pleasant to notice this instance in which its true illustrative value is recognized."



Answers to Correspondents: F. D. T. and others. We are quite unable to explain why the *Photo Era* enlarges its staff of associate editors so frequently. Better put query direct. Possibly the appointment goes with a new subscription. We agree with you that the *P. E.* is a "good thing."

W. E. W. Startling developments. Will write.



A review of the more important novelties shown by manufacturers and dealers at the recent national convention will be given in the next issue of this magazine, space and time not permitting in this issue.



The St. Louis and Canadian Photographer, St. Louis, Mo., has reduced its subscription price from \$3 to \$2 per year, paid in advance.



The Wynne Exposure Meters are hereafter to be handled by The Infallible Exposure Meter Co., 237 South 4th street, Brooklyn, New York, from whom all information bearing upon their various uses may be obtained.



We have received an extremely interesting announcement from G. Gennert, 24 East 13th Street, New York, concerning Dr. Albert's "Eos" Collodion Emulsion, for which Mr. Gennert has undertaken the

American agency. This Eos Emulsion is intended to replace both dry and wet plates for a variety of purposes, copying, enlarging, process and reproduction work, and offers advantages not obtainable with either dry or wet plates. Its advantages and uses are fully described, with directions and formulæ, in the circular prepared by Mr. Gennert, and those engaged in reproduction work should not neglect the information it offers.



The Cooke Lens, well-known in Europe as one of the simplest and best of modern anastigmats, will hereafter be obtainable in this country. Messrs. Taylor, Taylor & Hobson, the manufacturers of the Cooke lenses, have established a branch office in the St. James Building, New York, under the management of Mr. J. Ronald Taylor. In a later issue we will describe the various objectives offered by this firm, including the Cooke Focusing Lens, which has peculiar advantages for hand-camera work.



A photographic competition, with \$1,500 in cash prizes is announced by C. P. Goerz, 52 Union Square, New York. The contest is open to users of Goerz anastigmats all over the world, and will doubtless bring out much good work from the ranks of amateurs and professionals. A circular giving full particulars can be obtained on request from C. P. Goerz, addressed as above.



"The Elements of Pictorial Composition." By F. Dundas Todd. No. 4. The Dime Series of Photographic Handbooks. 63 pp. Many illustrations. 10 cents. Chicago: Photo Beacon Co. New York: Tennant and Ward.

In this little pocketbook Mr. Todd gives us a capital résumé of the principles of pictorial composition as applied in every-day photographic work. We know of no better elementary work on the subject, regardless of price.



You can't tell from the length of his legs how far a frog can jump any more than you can from some advertisements how good the articles may be.

To afford the public an opportunity to personally test my goods I now offer a liberal

SAMPLE SET ^{AS} FOLLOWS

1-5 Pkg. Improved NONHALATION BACKING	10 cts.
1-4 " Blue Print Tubes (½-oz. each)	12 cts.
1-4 " Persulphate Selective Reducer Tubes	12 cts.
1-5 " Ideal Spotting Medium (will last a year)	10 cts.
1-8 " Hardening and Clearing Capsules (no alum)	6 cts.
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GENRE
PHOTOGRAPHY



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GENRE PHOTOGRAPHY

It is rather difficult to define exactly what genre photography is—since there is not a very decided opinion among artists just what genre painting includes.

Some authorities tell us that the term genre is applicable to various branches of picture-making, except the delineation of historical fact and landscape; others say that *tableaux de genre* are paintings of interiors with figures.

The generally accepted definition now-a-days is that a genre picture is one that tells a story.

The possession of a title or a little alteration in the action of the picture is often sufficient to convert it from one class to another. For instance: the bust of a lady is undoubtedly a portrait pure and simple, and a clump of trees beside a brook is decidedly landscape and nothing more; but let the lady be represented reading a book or gazing at a lily, or watching the undulations on a bowl of water, or let the landscape have sheep in it with a shepherdess, or a woman gathering twigs in the foreground, and at once an argument is raised as to the character,—one side maintaining that the portrait has become an incident picture and the landscape pure genre, while the other holds the contrary view. Give the pictures titles, however; call the portrait with the book "Meditation," the landscape with the sheep "Solitude," and at once the contestants will admit that both are genre.

It would seem, therefore, that a landscape becomes genre when the figure is of sufficient size or importance

to make it a special feature in the scene, rather than a mere accessory for the artistic balance of the view, and a portrait is transformed when the subject suggests some action or motive.

Genre photography, therefore, would seem to have for its chief characteristic that it deals with the ordinary world about us; finding scope enough in the incidents of every-day life, or in some of the simple domestic scenes which tell a story.

Where Art is Manifest The Dutch school, in which genre painting originated, has taught us that it is the treatment of the subject, no matter how commonplace it may seem, wherein the greatness of the artist is manifest; that, after all, it is the lowly things in art as well as in life which confound the great.

It is said that the object of art is to interpret nature, not to change it; to render a scene or an incident so that it shall give pleasure, not by the novelty of unreality, but by the originality of unexpectedness.

The mere copying of what everyone sees or is forced to see by its obtrusiveness is not art, no matter how vaguely or indefinitely expressed. To have artistic value a photographic picture must not be a dull embodiment of prosaic facts. It must be made suggestive in a measure, as painting is made suggestive, but need not of necessity "point a moral or adorn a tale."

This quality of suggestiveness may be secured by the manipulation of the commonplace things of which the composition is made, by their proper association, combination and contrast. It is here that the faculty of invention or expression comes in. Have we not seen many a photograph the composition of which exercised the thinking faculty to supply something which the picture itself did not show?

Where would be the pleasure in a picture if the conception were so palpable that nothing should be left the mind to speculate upon, or, in other words, wherein no room was left for the exercise of the imagination? Not that the suggestion should be so vague, however, or the relation of the components of the picture so obscure

that it should be necessary to interpret the work as Bottom did to the players in "A Midsummer Night's Dream":

"This lantern does the horned moon present,
Myself the man in the moon."

So much, in brief, for the necessity of **Telling a Story** suggestiveness in the making of a genre picture. But a picture must be narrative as well as suggestive, and the genre picture in particular, since its essential quality is its story-telling power. But how can a picture, either by paint or chemicals, tell a story?

It is said that pictorial art is much more restricted in its method of addressing itself to the world than poetry or fiction. It appeals to but one sense—sight,—while poetry awakens all the senses to a lively perception.

Is the visual sense all that a picture appeals to? I think every one who has ever seen Hogarth's "Enraged Musician" hears in imagination the din. In this picture the composition shows a dustman with his noisy bell, a ballad singer, a pavior with uplifted rammer about to smite the cobbles, a man playing on the bagpipes, and a scissors-grinder; not far off we read a pewterer's sign and, to add to the din and rattle, in the distance is a church with a belfry. The picture, as Fielding says, is "deafening to look at."

Nevertheless, we are willing to admit that a picture depends largely upon the harmonious sensation it produces by color tones, light and shade, balance of lines, perspective and other visual motives. But should not a picture, even though its power of appeal may be restricted, attempt to express feeling or emotion? Is there no such thing as a pictorial idea?

I believe that the genre picture, as presented by modern photography, has proved that it is capable of suggesting some train of thought, even though it may need the prop of a title to do so. In other words, it demands the exercise of the inventive faculty by the photographer. But how is the faculty of invention or expression to be stimulated? Chiefly by the close observation of the life about us.

The first stimulus to action is most readily obtained from the study of the work of others. But there must needs be a method in our study. If the study alone of pictures were sufficient to make successful genre photographers, we might easily attain such eminence by reason of the abundance of examples accessible.

But with such apparent great advantages over our predecessors of a score of years ago, we really have more difficulties to contend with, both at the commencement and during the progress of our studies.

The wealth of examples is apt to create embarrassment. We wander through the salons trying to admire what really we do not appreciate, and try to convince ourselves that an approach to such a standard of excellence will be a happy consummation, happy enough for us, and so our aim is from the first low, and the tendency is to self-satisfied mediocrity.

Then, again, in our dilettante method of study we find it so easy to imitate in a superficial way. Our imitation catches the eye of the superficial critic, and the praise we get deludes us into the belief that we, too, have achieved greatness. For instance, we suppress or altogether disregard detail in our work, not because the omission appeals to our sense of the beautiful, but because some production of recognized merit has made the omission. We fail to see that the virtue was not in the omission, but in the harmonious subordination of detail to artistic effect; and so we miss the real lesson of the picture and emphasize only that which the artist intended to keep in subjection. If we must imitate, our imitation should be on principle.

The adoption of an idea, incident or attitude in posing, or arrangement of composition from some one else does not really lay us open to the charge of plagiarism. A wholesale appropriation, of course, is dishonesty; but whenever the translation can be made with a certainty of improvement, or an idea can be called into a new relation or association, its adaptation is deserving of commendation.

It may even be admissible, as a means of study, to copy the general effects of a picture, the forms of its masses of light and shade or its arrangement of lines, and at the same time vary all the materials that contribute to these, substituting, for instance, a slight object for the light of the window, or a dark object for a shadow ; or we may further disguise the abstraction of general effect by reversing the lights and shades of the picture. But there is doubt here whether such practice is praiseworthy, whether it is really imitating upon principle, whether it would be honest to the painter, or whether, after all, it might not be evidence of poverty of invention. The habit of looking into the pictures of others for suggestions or incidents is attended with danger, and has a tendency to repress self-effort.

Copying as a Means of Improvement Northcote, the painter, was told that a picture had been painted by one of his contemporaries which could not be distinguished from a Claude. His reply was : " Then I am confident it is good for nothing. If you had said that the picture showed merits equal to Claude's, I would wish to see it." For to be equal to Claude, Northcote knew that a painter must be as distinct from him as he was from all the painters before him. He must have looked at nature for himself as Claude did, availing himself of the assistance of previous art only to the degree and for the same purpose that Claude did.

After this, I think that it will be admitted that the copying of entire pictures directly from the painter is not commendable. Such photographic replica, however, frequently receive undue credit and even come off for a large share of approbation from critics and convention orators, who, in some cases being artists themselves, should see and point out the baldness of the invention and servility of taste.

I call to mind a picture which was exhibited and applauded that was nothing more than a literal copy of John Collier's painting of Miss Huxley, which received its just praise when exhibited twenty years ago. The photographer (to whom we give the credit only for knowing a good thing when he saw it) had taken the

trouble to hunt up a young lady of the style and build of the original, had her go to a head-dresser to have her hair arranged like the model, had the *modiste* make her a garment identical in cut and texture, and then exhibited his picture, and found many to admire and praise his work for originality. Gainsborough is a prolific source for extracts, and Rossetti and the Pre-Raphaelite school are just now springs of inspiration for the *soi-disant* art photographer.

Had the imitator gone to the painter for suggestions, either in pose or arrangement of draperies, he might have produced something appropriate and at the same time something which was his own.

The Value of Analysis A careful study of pictures by painters of reputation as an art education (not a few minutes' glance at a print of a celebrated work of art just before posing your models, but a rigid analysis of the means by which artistic effect is secured) will give the photographer an insight into the rules on which the composition was constructed; and by reference to nature, with a regard for the peculiar demands and limitations of photography, a picture may be produced, not a palpable copy.

Observation Nature—all life indoors and out-of-doors—is a broad field of study which yields a rich harvest to the tiller who is desirous of producing a suggestive picture.

We all know that the greatest of the painters derived hints for their compositions, and even single figures, from the streets, drawing-rooms and domestic circles. Stothard himself tells us that he purposely walked the streets for subjects. I am sure he would have been a diligent kodaker. His sketch-books were filled with groups of figures in various attitudes and scenery, made without any selection, so to say, but merely of what chance threw in his way while journeying about. Sometimes we see objects which he had evidently seen looking out of the windows of his inn, where hostlers are changing the horses, or of something he saw along the road from the top of the stage-coach. Just such objects and scenes as everyone of us has enjoyed he jotted down in pictorial short-hand notes, to employ

some time with appropriate setting, so that he never fell into the error fatal to originality of going to nature for things only which he had seen represented upon the canvas of the painters.

The Basis of Invention Selection and combination are the principles on which invention must work, and originality, after all, is the power to see commonplace objects under artistic aspects.

In exercising our inventive power, that is, in selecting a subject for pictorial representation, care should be taken to choose one which has unity of action. There ought to be only one story or incident. In the secondary action the characters should be somehow connected with the main motive of the piece, and instead of distracting the attention from the subject, they should give aid in directing the eye and mind to the center of interest. Where we have more than one center of interest in a picture the dramatic effect is weakened.

Unity and Subordination In a story told by fiction, or a poem or play, there is always a hero or heroine about which the action centers. The subordinate characters reflect or supplement some motive of the leading character, and these under-characters are never so emphasized as to veil the brilliancy of the greater. But the relation between principal and accessories should not be so unduly depressed as to make the supplementary characters of such minor consideration as to add nothing to the harmony, but as rather distracting in effect.

Avoid Excessive Action The great thing to be avoided in the composition of a genre photograph is what might be called excessive action of interest. In the zeal to convey the idea the photographer puts every one of his characters to strenuous effort, and they naturally overdo things.

Have we not all frequently seen a photographic group which reminds us of Praed's lines where he is describing the effect of the village parson's call—

“Whene’er they heard his ring or knock,
Quicker than thought the village slatterns
Flung down the novel, smoothed frock,
And looked decorum’s perfect patterns.

Alice was studying baker's bills,
 Louisa looked the queen of knitters,
 Jane happened to be hemming frills,
 And Ann by chance was making fritters."

Our intention in the picture is first the motive, then the study of the characters which interpret that motive; otherwise the composition will be one of shreds and patches.

Where the principal actor guides the action and the accessories do not force themselves unduly upon consideration, we have a composition rich in motive yet quiet and subdued, as art demands.

I know how very difficult it is to get self-suppressed actors to take part in the genesis of the picture. Every one is so self-possessed and desirous to show his talent to the best advantage that he forgets he is only a part contributory and should not, like Shakespeare's immortal weaver, want to play every part. The result is that the photographic seeker after the picturesque gets no grouping expressing unity in variety, but merely a collection of individual portraits of small size on one plate. Even some painters' pictures convey the idea that the cap is off the lens. "Steady now, one second only."

The recent advance in photography has made necessary the employment of trained models for carrying out the pictorial idea. The professional model is a necessity to the painter. These models understand what is desired of them. They can be appropriately draped and posed. The painter rarely takes the first girl he comes across who has comely features, or the first man who has well-proportioned limbs, and drafts them into immediate service despite their inexperience. No; he selects from those who have, we may say, differentiated to the profession.

The idea of the picture must first be conceived, and then the models sought for to carry out that idea most completely and harmoniously.

Definiteness of idea of composition is a necessity in genre. Be sure of the Definite Idea idea, then go ahead. Think out its details, and plan its harmonious arrangement before attempting its actual execution.

A very slight change often brings in its wake other changes, and gets the whole work in a muddle.

It may happen that you notice, for instance, that a certain mass of white drapery would look better if black. You try the effect, and if the result does not come up to your expectation no harm is done, if you retain your conception clear enough in your mind to return to it again. But if your idea of the composition is vague and ill-defined, and you shift your models and accessories around too much, you may lose your conception altogether in the transmutation, besides running the risk of wearying even your professional models.

Preliminary Sketches It is well to make a rough sketch of what you intend. It is not necessary that you have skill in drawing, for a sketch, however crude, will give you the general position of lines and light and shade of the picture.

I have said a great deal about the conception of the picture, in which work the selective power of the photographer is predominant (the subjective part of our topic); but now let us say a few words about the objective phase of the theme. Every picture, no matter how poetic or highly imaginative it may be, must be constructed on certain mechanical principles, which must be studied like the rules of every other art if any effectual results are expected.

Composition Composition is making one thing out of several things. A book or poem is made up of words arranged in a certain way, but it is not only the thought but also the arrangement which conveys the thought which gives value. We all know how difficult it is for some of the poets to convey their ideas without obscurity, because they have not the power to wield language to the purpose.

A picture, even though it has an idea, must have that idea expressed in terms of the right kind of lines, of the proper lights and shades; and these elements of composition, instead of being restrictions to freedom of thought, are the very channels into which the idea more readily flows. Just as rhyme and metre are to the poet, so composition is an aid to expression for the photographer.

In the exercise of our power of invention it seems almost as if the various components were obeying some Prospero-like power, as if their relations had some previous existence, and that we were merely bringing them together again. A sort of spontaneity is in all good composition — that is, it never appears labored or strained.

Different parts of the most diverse things will fit in and adapt themselves to one another, and will become helps to pictorial effect instead of the hindrances or obstacles we first supposed them to be.

There is no design in a load of stones dumped out of a cart. It is only when the stones are set in appropriate form and manner in the beautiful edifice that we see the idea of the architect gradually unfold itself. In a picture, as in a building or any other structure, we must study the relation of parts and the general harmony of their association.

Natural Grouping In natural landscape there is, to be sure, artistic grouping, but it is not a constant feature. All the incidentals do not compose harmoniously. Even in what might be called nature's genre, we observe an arrangement of things in agreeable clusters, so that it would seem that grouping is a universal law.

We see this grouping wherever there is a crowd of busy or idle people, where sheep or cattle gather together in flocks and herds, in pasture, or by the water's edge. Even inanimate things, rocks and trees and clouds, seem to have at times a feeling for harmonious relations; otherwise we would never get any of the direct transcripts from nature by photography in which is manifest the esthetic law of unity in variety, the subordination of many to one. But there are so many chances in nature of encountering distracting elements.

In the genesis of a genre picture we have the elements more in a flux, and they may be better molded to our peculiar ideas, better subjected to the laws of esthetic composition.

The principles of unity in variety and subordination may be more effectually secured by making our pictures consist of as few elements as possible compatible

with clearness, observing simplicity and not trying to crowd into the scene a vast congregation of discordant things, each of which cries out for supremacy and so weakens the general effect.

We have frequently heard the criticism of a picture to this effect: "That space looks too empty," and the ever-receptive photographer looks round for a stop-gap to fill the hungry spot, drafting into service anything convenient, no matter how incongruous to the theme it may be.

Now, perhaps, that gap in the picture really added to its effect. Your figures should always have space enough to move around in comfortably, and sometimes a vacant space behind a figure gives it a marvelous effect of motion. It suggests that the figure has moved through that space.

The modern decorative style of painting which has been copied from the Japanese, of cutting off part of the picture by the edges of the frame, has been seized upon by the photographer in search of the bizarre. For some varieties of work it is allowable to suppose the figure has some interest outside the margins of the print or frame, but it is often only an evidence of affectation.

It is well to be economical of space, and large areas of background settings to our figures are not desirable; but, on the other hand, when we cut out our prints so that the figures are too large for the space, the effect is very unpleasant. An erect figure especially, if the head is inclined, looks ridiculous in a border which cannot possibly allow of the head being raised without bumping against the top.

The mere huddling together of things, therefore, is not artistic composition. Each element introduced must play a part like a score in musical harmony.

A pictorial group is not composed when a background is run into position, a studio chair gracefully placed, an elaborately carved table set at the proper angle to most effectually display its vulgar contortions, a rug thrown in front with careless affectation, then the living models invited out of the dressing-room to

pose themselves as naturally, and to look as consistent with the surroundings, as a due regard for the fashionable cut of their garments will permit. Such a tableau vivant the scene-shifter of a vaudeville show can get up in the interim of the ringing down and up of the drop curtain.

A composition (we repeat, for it is essential to keep in mind) to be effective must be animated by a definite purpose, and should not, like the duke in Shakespeare's play, "Twelfth Night," have its business everything, its intent everywhere. The more graphically and distinctly the purpose is related the more successful will be the pictorial result.

Lines Management of the lines in the picture has much to do with the character of the subject, and it is important to know the value of the direction of lines interpreting a pictorial idea.

A perpendicular line is said to give dignity and is often very effective in genre photographs which employ a single figure. Some of the finest genre portraits of the old masters represent their subjects in erect postures with the lines of the drapery even severe, not much broken by wavy folds. Could any portrait be more effective or more poetically suggestive than Da Vinci's "Mona Lisa" (La Giconda), or Palma's "Santa Barbara"?

The horizontal line gives repose and calmness. Dettaille in his "Dream," representing soldiers with stacked arms asleep upon the battlefield, makes effective use of the horizontal line and gives emphasis by a repetition in a minor key by means of a furled flag supported on two upright stacks of muskets. The repetition of a motive in a subordinate key always adds to the effectiveness of the composition.

The diagonal line is adapted to perspective effects, such as a roadway between trees or a wall or fence running along on one side of the way. A street scene, for instance, where the roadway crosses diagonally the rectangular streets affords excellent opportunity to show the pictorial force of this variety of composition.

The point of view thus chosen adds to the effect, as it

gives the idea of motion to the picture by making the general trend of the road an oblique line across the view. If the lines of the street are taken so as to give the view of the curbing parallel, the effect of life and animation is destroyed and we have only an instantaneous picture of a petrified scene, with all the motion arrested as if some Gorgon's head had turned the living figures into stone.

In genre landscape,—that is, where the landscape plays the part of accessory to the model,—the idea of motion is conveyed by the introduction of the diagonal variety of composition by making the line of the hills or trees slant and so cut off part of the sky view.

The pyramidal arrangement of the group has been so overdone in photography that one hesitates to recommend it, but where the lines are not too suggestive of set arrangement it is often very effectively introduced in composition.

It may be remarked that, though the laws of composition have been best followed by the best painters, the principles resulting from them are not always ostentatiously conspicuous in their work; and, indeed, art is always the more effective in the degree in which its impression is made by means which do not court attention.

The pyramidal composition should be employed to express the idea of repose, but the expression of repose should never be so profound that the idea of the picture is completely entombed in the lines of the pyramid.

It is said that the serpentine line is more beautiful than the straight line, and the round or oval form more beautiful than the square; but really every line may by situation and contrast become a line of beauty, and every form by association be transformed into a shape most acceptable to the eye.

Hogarth was strenuous in his recommendation of the pyramidal form of composition. He thought it the best, and though he endeavored to carry out his belief in his own work, yet we never find him adhering to it so rigidly as to suggest mere artifice.

The quiet and sacred dignity of many of the ancient holy families and other subjects of sacred art are largely

due to the unobtrusive conformity to the pyramidal form employed in their composition.

Dr. Johnson said to Miss Burney :
About Critics " There are three distinct kinds of judges upon all new authors or productions. The first are those who know no rules, but pronounce entirely from their natural taste and feelings ; the second are those who know and judge only by rules ; and the third are those who know, but are above the rules. These last are those you should wish to satisfy ; next to them rate the natural judges ; but ever despise those opinions that are formed by rules alone."

So the construction of a picture demands an observance of the laws only to the extent that those laws are made subservient to pictorial interest. There are times when it may be necessary to dispense with some of the established rules of art ; and taste will always perceive when it is preferable to break through them, but it will never condemn them. We recollect the story of Louis XIV and the gentleman who stepped into the carriage before His Majesty rather than keep him waiting through observance of courtly etiquette. It is impossible to note all the rules found in books of art, or which have accumulated from the varieties of practice of many artists.

Heads Whatever the subject of the picture
in Grouping may be, the eye is always first attracted to the heads, if it treats of figures. It is therefore of the greatest importance to carefully consider their relative positions, so as to produce a good visual impression, since we have tried to show that a picture must depend largely for its effect upon the pleasure it affords the eye by the disposition of its lines and forms.

When the imaginary line which connects the heads forming the group suggests the concave, the effect is not as pleasing as when the line is convex. The convexity is not wholly dependent upon the heads, as it may be helped out by the drapery or other accessories. The heads should never be equidistant, or so placed that imaginary lines connecting them would make any regular geometric figure, circle, square or triangle. By simply shifting the position of the figures it is easy to break up this unpleasant uniformity.

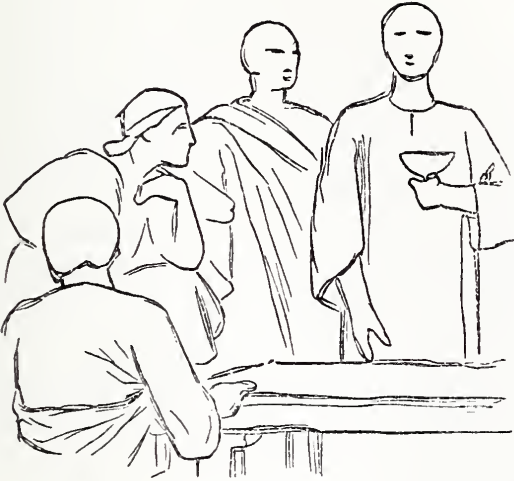


FIG. 1



FIG. 2

In Fig. 1, although each head is turned a different way for variety, the unity of the picture is destroyed, since each head is equidistant from the other and each becomes a separate point of interest in the curved line which the eye cannot help tracing.

In Fig. 2 there are four heads, so arranged as to make a perfect lozenge. The shifting of a single head breaks up the unpleasant monotony.

It is sometimes necessary to have two heads on the same horizontal line. The composition may sometimes demand it, to suggest repose or tranquillity; but it is never allowable to have two heads directly in the same vertical line, as in Fig. 3, where we have a seated or kneeling figure in front of an erect one. Arrange the former so that it is a little out of the direct line of the standing one.

In groups of three figures, where one is seated, the seated one should never come in the vertical with either of the two standing or exactly half-way between, as in Fig. 4, but should be arranged as in Fig. 5.

Irregularity in the arrangement of the heads is always desirable unless there is some special motive to the contrary. All sharp

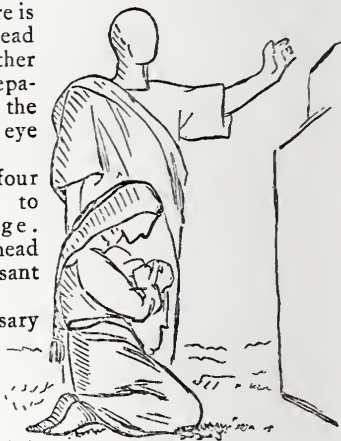


FIG. 3

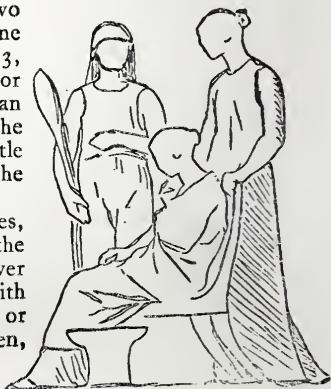


FIG. 4



A STREET IN ANDERMATT
J. Bathgate



HOUSES IN UNTERSEEN, INTERLAKEN
J. Bathgate

angles are to be avoided. An obtuse angle is much more pleasing. In a single figure an acute or right angle may not be so noticeable; but where we introduce several figures such sharp cutting lines at once arrest and distract the eye, giving harshness to the composition and destroying the look of spontaneity and easy-flowing movement.

Where two figures are so placed that they necessarily cross arms, avoid a right-angle cross.

Converging lines in a group are generally undesirable; for instance, as in Fig. 6, where all the arms seem to radiate from a common center like the spokes of a wheel, the eye naturally turns to the common point of convergence, and unless it gets rewarded by something of interest it is disappointed. But if the radiation conducts to something interesting, necessary to the interpretation of the topic of the picture, it is pictorially of value. For instance, suppose we wish to represent a group struggling for a bag of gold on a table. The



FIG. 5

From "Adoration of the Magi" by Fromentin

motive of the struggle should be the motive of the picture and the converging lines should be contributory.

Practical Applications In modern photographic compositions the styles are so varied as seeming to defy any classification. Most of them, however, are modifications of the primary forms we have described, but all emphasize the point that prominence should be given to the leading idea, and that the characters of the composition should lead up by concen-

tration, making the motive of the picture more intelligible, whether it be intellectual or merely a pleasing assemblage of visual perceptions.

Composition considers not only the disposition of lines and forms, but includes in its scope the balancing of masses of light and shade, tones and values. But before leaving the subject of lines of composition we must touch upon the means by which nature constantly makes assemblages of objects pleasing to the eye; for, as we have said, it is possible to have direct transcripts

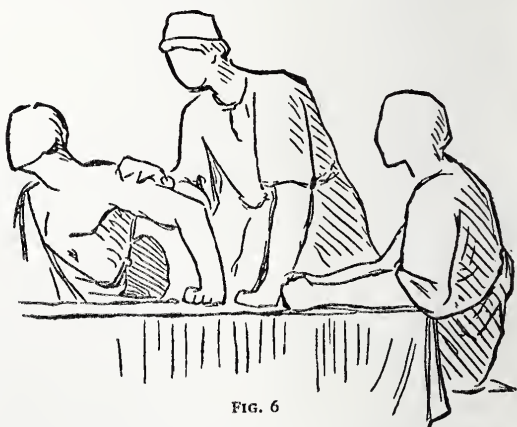


FIG. 6

from nature, which both in line composition and tonal values are perfect pictures.

It is chiefly perspective which gives the eye pleasure, for linear perspective is the basis of linear grouping.

Beautiful productions, of course, were made by keen-observing painters before the discovery of the principles of perspective drawing, but it was by those only who went directly to nature for inspiration, and who were assured that they could trust the avouch of their vision. Some of the old masters, despite the beauty of their coloring and chiaroscuro, offend wofully by false perspective. It was only after the laws of perspective

were understood that the general appearances of nature were more correctly copied.

We all have more or less experience in observing the effect produced by perspective, and when there is considerable regularity in objects the effect is strikingly manifest. When we look down the street at the receding rows of houses on both sides, or along a railroad track, we notice in the one case the vanishing point in the distance, and in the other the gradual diminishing size of the locomotive as it passes away from the station. Its proportions seem inordinately dwarfed compared with the last car of the train.

In a landscape or interior genre picture the irregularity of the objects makes it more difficult to determine the vanishing point, and the painter sometimes gets his horizon line improperly placed or not as effectively placed as it might be.

A good deal of the impressiveness of the picture depends upon the height of the horizon line, a point in composition not always taken into consideration by the camera artist. Convenience of focusing makes him bring the horizon too near the center of the picture. It was a remark of the painter Stothard that grandeur might be obtained by striking either a high or a low horizon, but when the horizon is just in the middle, effect must be sought for in some other artistic principle than perspective. In many of Stothard's own pictures he exemplifies the value of a high horizon, and if we want to see the impressiveness of a low horizon we will find it in Titian's works.

By perspective we are, therefore, taught that all objects are apparently altered in magnitude and shape as they approach or recede from the eye, and that these alterations are infinitely varied as the points of distance of sight are changed ; so that it makes a marked difference pictorially at what angle our camera is placed as regards the point of view.

The Point of Interest The photographer, like the painter, may focus where he pleases, but that point, remember, becomes the center of interest. In many of the Dutch paintings, which must be the cynosure for every photographer of genre, we see

that the point of interest is well defined and all the lines of the picture intentionally conduct the eye to the spot of convergence. Understand, the converging point of interest is not necessarily the center of the picture—indeed, in the majority of cases it had better not be.

Da Vinci has made the center the point of interest in his picture of the "Last Supper" because the subject demanded it.

The point of sight may be shifted right or left or raised high or low, as needs of sky, middle distance or ground may demand.

False Perspectives The use, or rather the abuse, of the wide-angle lens is responsible for many examples of violent perspective.

In looking over the pictures of the painters who flourished just after the discovery of the principles of perspective, we see how frequently the thing was overdone in the zeal, or it may be, pride, to exhibit a knowledge of the new art. Just as in certain photographs of interiors with figures we often see the point of distance chosen which brings one of the vanishing points within the picture itself; that is, it represents the rectangle obliquely to the plane of the picture. But in both the case of the painting and of the photograph there is an apparent want of truth, although the actual truth is represented.

Certainly the perspective should be so managed as not only to be true but also to look true.

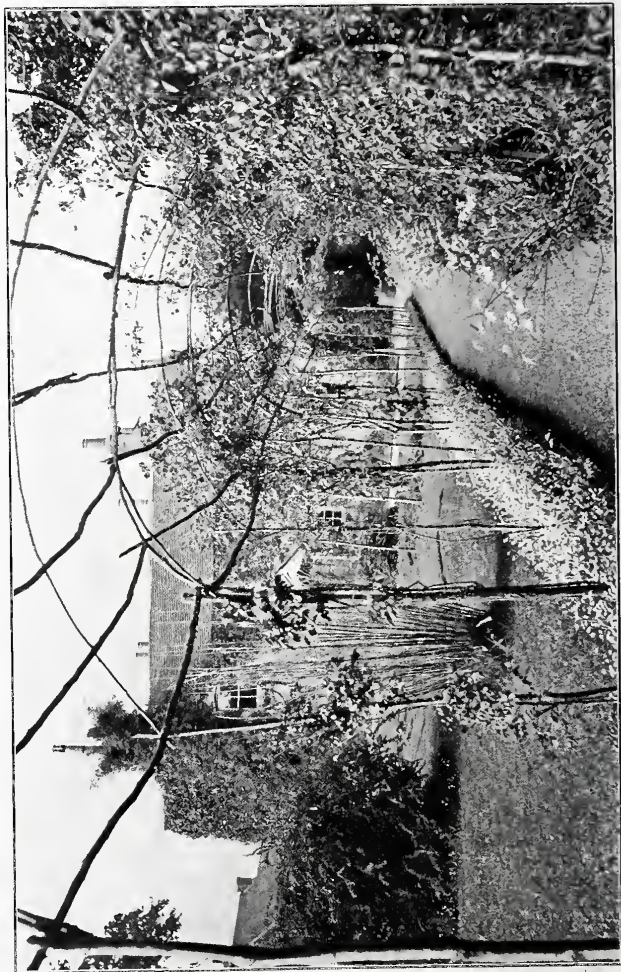
The ceiling of the Night Cellar in which Hogarth's "Idle Apprentice" is taken into custody is a glaring example of false perspective, arising from placing the vanishing points of the beams of the ceiling within the composition of the picture. And yet Hogarth published a special work to indicate the gross errors incident upon a want of knowledge of the principles of perspective. An interior always looks more pleasing in effect when the point of distance is placed further from the plane of the picture.

This is of special consideration for the photographer. If not observed, neither the floor nor the ceiling appears to be level. The Dutch painters to whom I again and must continually refer, managed most effectively their



PRINCIPAL STREET IN ANDERMATT

J. Bathgate



HOME OF THE LATE CHARLOTTE M. YONGE, OTTERBOURNE, HANTS, ENG.
F. Mason Good

views of interiors, having perspective more directly under the control of good taste. Always prefer parallel to oblique perspective, as it greatly assists the level look of floors and ceilings.

**The Planes
of the
Picture**

The plane of the picture itself is subject to the laws of perspective and becomes altered more or less in shape according to the point from which it is viewed, and it carries with it all the lines on the surface that are parallel with or perpendicular to the horizon, just as our vision shows it and just as a properly applied lens would do.

Foreground

But it is not always that the desired lens can be brought into play when one uses a real living-room as an interior setting to a genre picture. One usually cannot get far enough off to secure pleasing perspective by use of a long-focus lens. At close range with a short-focus lens the objects near the camera are made disproportionately large, while things only a short distance away from them are unduly dwarfed.

The floor seems to run up-hill. The appearance of things is still further exaggerated when the point of sight is taken angularly instead of directly in front; yet all this appearance of unreality can be shown to be mathematically correct, and a skilled draftsman as a piece of perspective legerdemain would be able to sketch just such a picture with the identical distortion. These impositions of the lens are to be overcome by using as narrow angle of view as possible to represent the subject properly, by getting off with our camera from the main subject as far as possible and by removing objects in close proximity to the lens.

There is an obvious advantage in getting back with our camera. Generally speaking, considerable bare space in front (foreground) adds to the dignity of the subject. The dignity is also made contributory by spreading out the legs of the tripod so that the camera is brought down to a lower level than the height of the eye when standing.

The neglect to place the camera low where the character of the subject demands it is exemplified in many a

photograph where one object is a little beyond the other but in the same line. By the perspective the further removed object seems at an angle of forty-five degrees and as if about to slide down upon the unfortunate things below it. Though true that much of the impressiveness of the picture depends upon the lowering of the horizon, it is not always possible for the photographer to lower his horizon to the same level the painter takes, even though he places his camera on the ground.

When figures are introduced the position of the horizon is a matter of considerable importance. If the camera is pointed so high that the horizon intersects the heads of the figures, the effect is decidedly unpleasant. The height of the camera is a subject which attracts but little attention from the photographer. A good point of view is a *sine qua non*, and, this secured, he thinks his composition complete, whereas it might be further improved by a little lowering of the tripod legs.

Another important consideration in
Background the composition of a picture is the background, by which term is to be understood everything seen beyond the plane on which the figures are arranged.

A background is an absolute necessity. There must be a setting to the picture. There must be something to relieve the figures, to explain the reason why they are there in the scene, to help tell their story,—in a word, to complete the picture.

There are some qualifications demanded in the helpful adjunct. In the first place, it should never be obtrusive. It must not attract more attention than its subordinate office may fairly claim. There should be no overlaying our picture with a multiplicity of details which add nothing to the interest, challenging nearly as much attention as the figures themselves. Neither should the background be unmeaning or inappropriate, but rather blending with the main topic like a well-adapted musical accompaniment, supporting and assisting instead of distracting and annoying.

Though a background may be a troublesome and sometimes a dangerous companion to the figure, it is nevertheless capable of being made a most valuable ally;

for, though in general it should be negative and retiring in order to give due prominence and force to the figures, it often affords the photographer an opportunity of showing his originality by the introduction of striking associations or ingenious illusions, as do many of the backgrounds of Teniers, Jan Steen, Ostade and others of the Dutch and Flemish school of painting.

Besides, the background may be of great technical service in giving vigor to parts of the picture by relieving the figures against it, or softness and repose by losing in it unsightly but necessary features of the picture.

The Italian painters of the fifteenth century, especially the Venetian school, sought to relieve their figures, when dressed in dark clothing, by backgrounds lighter in tone; thus giving them a distinct and at the same time natural appearance, the gradations in the background tones enveloping the figures in an atmosphere which made them stand out and not look like mosaics.

Reynolds considered this strong relief of the Venetians as less desirable than breadth and fullness of effect, and hence his figures supported the strong shadows by still stronger darks of the background. In consequence of this method, he frequently altered the relative tone of his picture, making a black coat, for instance, assume the appearance of a gray one by extreme depth of tone in a curtain or some other object back of it.

Many of our impressionistic photographers have recourse to a similar device, but not always with the consistency or from the artistic feeling which prompted the great English painter, but merely from the desire to present something singular and sensational, "something far more rare and strange," forgetting that Reynolds had recourse to means they cannot employ in photographing of making his figures agreeable by the introduction of rich colors in other parts of the picture.

A point should, however, be remembered, that though Reynolds in practice pursued breadth of effect, yet in his "Discourses to Young Painters," he holds up as examples for imitation the Dutch and Flemish school, who never followed a practice so contrary to nature.

Light and Shade The marvelous management of lights and shadows in their pictures of familiar life seems to arise naturally from a close imitation of the ordinary effects and circumstances of the subjects they choose. They aimed to captivate the spectator by truth, simplicity and beauty of finish.

Things to Avoid To refer again to some of the methods of the modern workers in photography, we must acknowledge that one cannot always appreciate the persistency with which they diminish the light in a picture, confining it to one focus, allowing no other light to vie with or interfere in brightness, and leaving the extended darks empty and blank without any enlivening by reflected half-tones. While concentration of light and contrasts of relieved shadows are often desirable, there is artistic limit; and when the light is too solitary and in too small a quantity, it is impossible to prevent the picture from having a magic-lantern effect, more especially when the picture is supposed to represent a view outdoors with a natural landscape for background accessory.

Why has this effect been sought after by the impressionistic of the advanced school? Why have all sorts of printing dodges, faking and monkeying with the studio lights been called into requisition to give this bizarre presentation of nature? Candidly, I believe, not from any conviction that the result is beautiful, and gives them any real pleasure, but simply because of education. They have studied the reproductions of the great painters in chiaroscuro in black and white engravings and not from the richly colored originals.

They seek to make their productions correspond with the line or mezzotint picture and end in copying only the unavoidable exaggerations which the reproductions have emphasized. Correggio and Rembrandt, the consummate masters of decided masses of light and and shade, and brilliancy of effect, knew how to intermix agreeable middle tints; and there is besides so much propriety in the characters and expressions of the figures and such consistency in the whole effect as to delight us, and at the same time to make us excuse what we know is an impossibility in nature.

Correggio, in his wonderful picture of the "Nativity," by introducing a group of angels floating in the divine light emanating from the infant Saviour, calls legitimately upon the imagination; but the employment of a like device by the photographer would either shock or amuse, if it did not disgust us by its incongruity.

But the question will naturally be asked: Has one no right to make use of devices to heighten an effect or produce an agreeable impression by management of background accessory or after-treatment? We answer: Assuredly, but we might add, "All things are possible, but all things are not expedient."

Certain devices are not only justifiable but almost indispensable in genre picture-making. Any device is admissible which affords opportunity of disguising the formalities of dress in the abrupt or awkward termination of parts of the figures or anything which gives agreeable shapes to the lights and shades, roundness and unity to the whole. But all such devices should be employed consistently and in accordance with the appearance of truth and reality.

Some subjects require the most delicate tones; others may be made to glow with vigor. "Study what most you affect." Try to make something beautiful which appears beautiful to your individual taste, and do not copy what some noted salonist blazons forth as transcendent art. Cultivate your own individuality.

A picture may be made effective, either by simplicity or by richness of its harmony. A violin solo can delight us by its exquisiteness, and so can a full, rich orchestra of flutes, bassoons, violins, violas, trombones and bass drums. The skill of the master comes out equally in both. However, there is more danger of failure in the struggle for brilliancy than there is in the natural yielding to simplicity. But then, again, there is a tendency to tameness from too much simplicity.

There must be a rhythm and alternation from excitement to repose.

A considerable portion of subdued tones is necessary to reconcile the leading high lights

and deep shadows. They vary the scale and add to the harmony. Warm tints may be employed to check those that are cold, and vice versa. But reflections should not be employed to that degree which might take away from the solidity and relief of the picture.

The modern tendency in values is in the direction of less contrast than would have been regarded some years ago. Contrast The black color of a dress, for instance, is not relieved by white lace trimmings, and then set against a gray ground to bring out the figure in relief; but the ground itself, on the contrary, is made only a trifle, if any, lighter in tone than the drapery of the figure. To do this skilfully demands much tact to get delicacy without smudge, and consequently smudge is oftener the result. It is necessary to give the appearance of atmosphere between the figure and the background so as to avoid its seeming to be plastered to the wall.

In photography the management of such delicate tones so slightly differentiated is exceedingly difficult, as the artist-photographer has no color to aid him in his selection of scale. The causes of variation in pitch between objects of the same color are found in the difference in position as regards the dominant light, difference in the amount of illumination they receive, and also in the difference of the quality of the object in reflecting light.

The Dutch school thoroughly understood the importance of relative tone of the strength of the different tones of the picture ranging between the deepest and the highest light, irrespective of color, and their works are therefore of great value as instructors. Velasquez, too, is always right in relative tone, and many a lesson may be learned from engravings or photogravures of the works of the modern French school.

It may not be irrelevant to the subject to briefly consider the question of finish most suitable for a genre picture.

The Question of Finish We have frequently referred to the Dutch painters, and as they are generally, though unjustly, accused of intense realism, it might be inferred that the only suitable method of rendering would be scrupulous pre-

cision in representing detail ; but as the greatest of this school indicated rather the beauty of surface and richness of color than imitation of minutiae, there is scope for the expression of the most advanced exponents of the modern school. Taste alone can settle the difficult question of finish.

A picture is finished when the intention of the artist is best and fully conveyed. Details may be omitted or graphically portrayed, and the effect be equally satisfactory to an unbiased spectator, who judges from pure impression of the effect. The treatment will vary in the hands of a conscientious photographer, possessed of taste and judgment. He will seek to express literal detail in some parts of the picture, while a broader treatment will be reserved for other parts, without in the least weakening the unity or lessening the general artistic expression.

A picture, as we have endeavored to show, must be an imitation of nature, whether it is by brush or camera ; and monochrome photography holds its status in art by the simple of its faithful representation of nature in whatever phase she is presented to us. It must, therefore, take the proper channel in art, by which alone it may be rendered effective.

But as we agreed at the beginning of this monograph, all art must be suggestive, however realistic. Therefore it must leave something to be imagined. An absolute copy without any qualifications will be less interesting than something which, while true and actual, still demands the employment of the intellect to discover the personal element in the work, the illusion which the artist sought to create. It is sometimes necessary to give atmosphere to a scene or mobility to a figure or group, which a hard, wiry accuracy of rendering would utterly destroy, so that even a blurred or indistinct outline may be found necessary at times. Nevertheless, we must not forget that baldness is not simplicity. Poverty of detail is not evidence of artistic feeling. It is not accuracy of finish but tastelessness of finish which is to be avoided.

The technical accuracy of the realistic painters, far from detracting anything from the value of their con-

ceptions, often enhances the range of their dramatic power of expression.

Look at the varied and complex **Alma Tadema** powers of minute draftsmanship in the pictures by Alma Tadema, especially architectural detail. The translucency and peculiar glow, as well as the texture of marble, is there. There is no mistaking it (even in the engravings from the paintings) for gold or clay or wood. We do not think, apologetically, it is marble because it is white veined with blue and used to represent the walls of a Roman villa or bath.

Neither Reynolds nor Gainsborough, ideal as they were at times, thought it beneath their attention to accurately draw the frills and trimmings of collars and cuffs with photographic perfectness of detail and finish.

Even in Reynolds' peculiarly ideal study of Mrs. Siddons as "The Tragic Muse," there is a human sweetness and beauty in the accurate little touches of detail in dress and drapery.

Both these great painters, everywhere in their work, show a predilection for representing external and corporeal qualities. Reynolds' picture of Mrs. Pelham feeding chickens (a true genre, though only intended for a portrait) has a delight for everyone, because, amongst its other qualities, it has all the accuracy of a well-conceived photograph.

We have all been educated to look upon paintings with a sort of consideration for the limitation of art to represent texture, so we let pass, considerably, a leather tree, or a paste-board rock and let the "imagination mend them."

Jules Breton's picture, "The Communicants," is not one whit less admirable because it renders texture accurately. It is a large picture, and size is sometimes an excuse for broad treatment, but he does not disdain to paint clothes and shoes and flesh so that we have an idea of their specific qualities.

I may seem a special pleader for judicious rendering of detail and may betray my peculiar predilection, but my purpose is to convince the photographer of genre that his work should more truly conform to suggestive



CATHOLIC CATHEDRAL AT PHILADELPHIA

From a "pinhole" photograph

Frank S. Dobbins



TUBEROSES
F. Mason Good

realism in art than to the vague sentimental or poetic idealism.

There are hosts of great English, French and American painters who express themselves definitely and are not afraid of accuracy of finish, as militating against the suggestiveness or poetry of their conceptions.

A great critic has said, "He who can command or produce beauty, truth or power in the motive of his picture will never lessen its value or impress by trying to give it accessory truths and beauty." All true finish is added fact and therefore desirable.

Popularity of Genre Pictures of genre are always popular, because they interest people who are not interested by transcendental art and who prefer human to esthetic motives in a picture. The subject or story to them is paramount to the art itself, and in proportion to the vividness and animation with which it is presented is its greatness estimated. This does not mean that people are insensible to the influence of a work of art when it is conceived by so high a standard as to rouse the best impulses of our nature.

"His heart will teach him," says George Sand, "what his ignorance hides from him," but he is obviously uninfluenced by subtlety of treatment or technical cleverness which enrapture the enthusiast. It is the feeling displayed in the work, the sentiment, which appeals to him.

It is from this that his curiosity is excited by commonplace representations of daily life, at which the connoisseur turns away as too trivial for artistic presentation.

"All honor and reverence to the divine beauty of form," says George Eliot (Adam Bede). "Let us cultivate it to the utmost in men, women and children,—in our gardens, in our houses; but let us love that other beauty, too, which lies in no secret of proportion, but in the secret of deep human sympathy.

"Paint us an angel, if you can, with floating violet robe and a face paled by the celestial light; paint us a Madonna turning her mild face upward, and opening her arms to welcome the divine glory, but do not impose on us any esthetic rules which shall banish from the region of art those old women scraping carrots with

work-worn hands, those heavy clowns taking holiday in a dingy pothouse, those rounded backs and weather-beaten faces that have been over the spade and done the rough work of the world, those homes with their tin pans, their brown pitchers, their rough curs and their clusters of onions.

"It is needful we should remember their existence, else we may happen to leave them out of our religion and philosophy, and frame lofty theories which only fit a world of extremes. Therefore let art always remind us of them; therefore let us always have men ready to give the loving pains of life to the faithful representing of commonplace things,—men who see beauty in the commonplace things, and delight in showing how kindly the light of heaven falls on them."

A work of art in the present day derives its inspiration from conventional good taste rather than from any ecstatic, emotional feeling; and photography should recognize its mission in administering to the tendency of the times instead of attempting to elevate to an exalted pinnacle the feelings of the multitude by sensational methods or by touching upon the domain of sacred or imaginative art.

It may be well for those who love photography for art's sake to delight themselves with the contemplation of masses of light and shade in which the subject is vaguely considered or entirely ignored for fear of distracting the attention from the perception of tonal values; but the sane mind, which is practical and productive rather than visionary, finds its most agreeable sensation in themes with which it is intimately related.

Art is not reserved for an elect few (especially photographic art), but, like the literature of the day, is for the open court of the world. The "select few" being trained by a special course of study are, after all, capable of better judging or enjoying only the charm of method or finish of execution. Above these there is a beauty of conception of which execution is but the vehicle, and if this beauty is so overlaid with technicalities that the ingenious mind fails to appreciate it, the mission of pictorial art seems to us "cribbed, cabined and confined."

The mistake of the modern school of photography (despite what it has done in broadening our view of technical rendering) is its attempt to fence itself in from the the common perception, to indulge in a narrow exclusiveness, to dogmatically maintain its insistence that art appeals only to a coterie of elect ones.

Genre photography will, indeed, be doing good missionary work if it reclaim photography from what may prove to be a presumptuous Icarian flight.

JOHN BARTLETT.

BOOKS

Following in the lines laid down by Mr. Bartlett, the reader can extend his acquaintance with the principles of picture-making by photography by a careful study of the works of H. P. Robinson and Dr. P. H. Emerson. A collection of genres, reproduced from ancient and modern painters, will also be found useful as offering example and inspiration.



NOTES

Those interested in the development of pictorial photography in America should not fail to note the announcement of the Third Chicago Photographic Salon. Copies can be obtained on request from the secretary of the Chicago Society of Amateur Photographers, The Art Institute, Chicago.

The Salon will be held in the beautiful galleries of The Art Institute, December 16, 1902, to January 4, 1903, and its walls are open to all photographs of artistic merit, regardless of schools or creeds. The jury of selection comprises men well fitted to pass judgment in so difficult a matter. Our Chicago brethren have worked earnestly for the success of their Salons of the past two years, and we bespeak for them the practical support of our readers in the undertaking here announced.



The photographic sensation of these last few weeks has been the introduction of the Kodak Daylight Developing Machine. This is a cleverly devised and entirely practical convenience which abolishes the dark-room as far as the development of kodak films is concerned, and most acceptably rounds out the equipment for kodakery provided by the manufacturers of that popular necessity. The machine is being widely exhibited and demonstrated at all kodak stores, and is concisely described in our advertising pages. From that description it will be seen that the machine opens up wonderful possibilities, and does away with many of the drawbacks experienced in development by the usual method. Incidentally, its use will popularize the use of pyro and "time development"—which we note with pleasure. We commend the machine, and the claims made for its usefulness, to kodak workers everywhere.

Leon Vidal contributes the subjoined interesting note to a recent issue of *The Amateur Photographer*: "At one of the recent meetings of the French Academy of Sciences M. Violle discussed the advantages of employing the daguerreotype process, when an altogether exceptional fineness of detail is required, the plates recommended by M. Violle being glass, upon which a thin layer of silver has been deposited by the chemical process. The idea of reverting to the daguerreotype process, when extremely minute detail is required, is not new; but the suggestion is none the less worthy of attention when extreme precision in the matter of minutiae is required. The daguerreotype process can render a fineness of detail altogether beyond the powers of the gelatino bromide method, or even the collodion process. In the case of astronomical work, for instance, one cannot devote too much attention to the problem of finding a method capable of rendering the most minute detail."



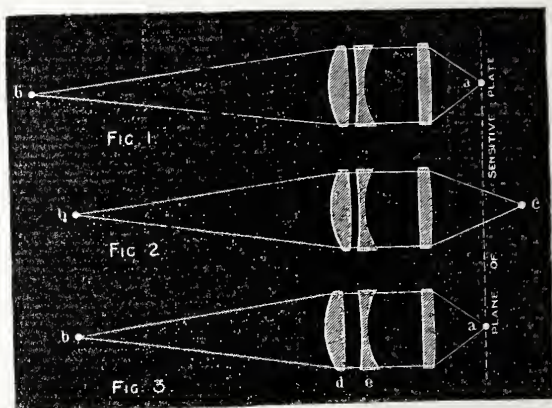
Cooke Lenses. According to the promise in our last number, we have prepared the following note concerning the Cooke lenses for hand-cameras and general photography, now being introduced in America by Taylor, Taylor & Hobson, St. James Building, New York.

The Cooke lens belongs to the modern anastigmat class, but has certain peculiarities which differentiate it from other anastigmats. Among these distinguishing features particular stress is laid upon the fact that the Cooke lens contains only three simple glasses, none of which are cemented together, although the two front glasses are separated by a shallow air-space. A natural consequence of this is that, while theoretically as perfect as the more complex anastigmats, its simplicity of construction facilitates the correction of the Cooke lens in a remarkable degree, besides offering other practical advantages, such as the avoidance of loss of light and internal reflections consequent upon a larger number of glasses and reflecting surfaces.

Another advantage based on the construction of the

Cooke lens is the peculiar power of adjusting the separation of the glasses, by which means the makers claim that in the final testing and adjustment of each individual lens, they are enabled to obliterate certain aberrations which cannot be removed from more complex cemented systems.

By taking advantage of this peculiarity, Messrs. Taylor, Taylor & Hobson have effected a radical de-



parture in hand-camera lenses, which is embodied in the new Cooke Focusing Lens here under notice.

As every amateur knows, he cannot focus at one time objects at widely different distances from his camera. If the lens is fixed at that particular distance from the sensitive plate or film which suits a distant object, it must be moved further from the plate if a near object is to be focused. For this reason cameras are provided with bellows or other means of varying the distance between the lens and the plate. Sometimes, however, in order to simplify camera and shutter construction, as in the so-called "fixed-focus" cameras, the lens is permanently fixed at a predetermined distance from the plate, so that all objects beyond a certain distance from the

camera are correctly in focus. Objects situated nearer than this minimum distance from the camera can only be brought into focus by the use of "supplementary lenses" or magnifiers suited in each case to the distances. This method of focusing, while adding to the convenience of the "fixed-focus" camera, has the disadvantage of being applicable only to those distances of object for which magnifiers are provided.

In the Cooke Focusing Lens a simple adjustment of the separation of the two front glasses provides a means of focusing objects at any distance within the range of the lens, while the lens itself remains at one fixed distance from the sensitive plate. The immense convenience of this feature will be readily apparent to all familiar with the "fixed-focus" type of cameras.

The principle upon which the lens effects this is plainly seen in the accompanying diagrams. Figure 1 represents in section the three simple glasses of a Cooke lens, which form at the point *a* an image of the distant object *b*. In Figure 2 the object *b* is shown nearer to the lens, so that with any ordinary lens the image would fall at *c*, and would be out of focus on the sensitive plate. In Figure 3, however, it is shown that by increasing the separation of the glasses *d* and *e* of the Cooke lens, the focus of the entire lens is altered sufficiently to bring the image of the near object *b* to focus at *a* upon the sensitive plate.



FIG. 4

Figure 4 shows a focusing Cooke lens in which the requisite movement of the front glass is effected by partly rotating the ring *A*, which has engraved upon it a scale of distances of object. In Figure 4 the

lens is set for use at four yards, the figures engraved on the lens hood being used for focusing, the other figures near the rear of the lens-mount being the *f*/ values, as usually engraved on the rim of the lens diaphragm.

It is obvious that the definition secured with a lens fixed rigidly in the camera and focused by adjusting the hood, will oftentimes be more perfect than can be obtained by racking the bellows in and out. This applies especially where the focusing arrangement of the bellows-camera has become loose or inexact in its movement.

The Cooke Focusing Lens is made in two series, working at $f/6.5$ (Series III) and $f/8$ (Series V). In the sizes up to 6 inches focal length they can be had mounted in a new aluminum alloy, which, with the clever mechanical workmanship which marks all Cooke lenses, makes these instruments peculiarly small in bulk and light in weight. We have enjoyed great satisfaction in our experience with a 6-inch focusing lens (Series V) and heartily commend the Cooke lenses to our readers as well worthy of their critical examination.

An illustrated booklet may be obtained from Messrs. Taylor, Taylor & Hobson, and those who take the trouble to ask for it will find in its pages much valuable lens information and a few clever diagrams illustrating debated points in the construction and use of photographic objectives.



Kirk Geary & Co., San Francisco, have placed on the market a new single-solution intensifier called Motak. We have given this a series of practical tests with under-exposed negatives and find that it is at once a reliable and efficient intensifier, well worth the price asked for it; viz., 50 cents per bottle, prepaid, from the makers.



Referring to their photographic competition, the Bausch & Lomb Optical Company, Rochester, N. Y., announce the selection of Mr. Rudolph Eickemeyer, New York, Mr. C. Yarnall Abbott, of Philadelphia, and Mr. W. B. Dyer, of Chicago, as judges. The reputation of these gentlemen assures a careful and impartial verdict upon the photographs submitted in this competition,

and those who are taking part therein will doubtless be pleased with the jury selected to pass upon their productions. A booklet detailing the conditions, etc., of the competition can be had by applying to any of the offices of the Bausch & Lomb Optical Company.



An interesting and profitable exposition of the focal plane shutter and its advantages can be had from a little booklet just issued by the Folmer & Schwing Mfg. Co., 404 Broadway, New York. The booklet is primarily intended to advertise the Graphic Focal Plane Shutter, but contains many things of practical utility to all interested in the comparative efficiency of exposure shutters of different types.



For clearing the degraded whites of platinum prints, as well as a desirable final wash water after the clearing of platinum prints, Mr. W. Huermann, American agent for Jacoby's platinum paper, advises the use of a 5 per cent solution of ammonium oxalate. We have tried this and find it of great utility.



The Farbenfabriken of Elberfeld Company, 40 Stone street, New York (selling agents for the well-known German house of Bayer & Company, anilin and pharmaceutical products), have entered the American photographic field with several products of interest to our readers.

Of these, the new developing agent, Edinol, is already fairly well known on this side of the Atlantic. This agent, which is said to combine the advantages of pyro and hydroquinone on one hand, and rodinal, metol and ortol on the other, is especially advised for X-ray and other technical work where extreme detail is desired and normal exposures are impossible. Its use for bromide paper, films and lantern slides is claimed to be equally advantageous. The manufacturers further claim that it does not stain the hands and is non-

poisonous. Mr. Alfred Stieglitz and other authorities have given edinol their personal recommendation as a universal developer.

Acetone-sulphite, an entirely new product, is another convenience offered by this house. It is recommended as a substitute for the sulphites in the preservation of developing and fixing solutions; as a restrainer in the development of over-exposed negatives; as a density-giving agent in intensification with mercury; and as a clearing agent in the reducing of negatives or prints with permanganate of potash.

Uran-intensifier is offered as a single-solution intensifier, put up in powder form, which can be used repeatedly and will keep indefinitely. With an after-treatment of weak soda solution it acts as a reducer, and used with Velox and bromide papers it will produce an agreeable brown-sepia tone.

Flashlight-Bayer is said to be a flash-powder of unusual actinic power which produces little smoke, no gas and no noise. It is also non-explosive.

Fixing Salt-Bayer is introduced as an effective, slightly acid-fixing agent which, in solution, keeps indefinitely and remains clear until exhausted.

The above information is condensed from the instructive booklet issued by the Farbenfabriken of Elberfeld Company, which can be obtained on request. In later issues we hope to report our personal experience with these products.



The receipt of many inquiries concerning collotypy as a practical reproduction method for amateur purposes must serve as our apology (if any apology be needed) for the publication of the subjoined technical note from Penrose's *Process Work* for August.

We are about to place on the market a new collotype process, distinguished by the trade mark "Sinop," which we believe removes all those difficulties and drawbacks that have made this otherwise very charming method of photo-mechanical printing so unpopular. A method has been discovered of preparing collotype plates so that they will keep indefinitely in the sensi-

tized condition, and it will thus be possible to buy a box of collotype plates just as one now does a box of dry plates for negative-making. At the same time, a simple arrangement has been devised for enabling the plates, although no thicker than ordinary dry plates, to be supported for printing without any chance of breakage. A masking frame is also provided. For printing in a small way an ordinary letter copying-press will serve, and about thirty to forty impressions can be taken without re-damping. The plate is very durable, and up to three hundred impressions have so far been taken from one plate without showing signs of deterioration. Probably a much larger number can be obtained if tested. After printing, the ink can be washed off and the plate put away for future use; it will keep for years and only requires re-damping to fit it for further printing. The whole of the operations preliminary to taking off the impression by this process can be performed in less than one hour. The exposure takes two minutes in diffused light under an ordinary negative, and the progress of exposure can be judged by examining the back of the plate. Fifteen minutes' simple washing in water follows, and then ten minutes' soaking in glycerine. In about fifteen minutes the plate can be fixed to the press, the surplus moisture blotted off, inked up, mask formed, and a proof taken. Collotype ink mixed ready of any color is used and applied with a "compo" roller. The inking up is quite easy, as the film is as white as opal glass, and, altogether, the process works like a charm. Any kind of paper can be used, rough or smooth, according to fancy, and the method is ideal for making pictorial post-cards.

The outfit, comprising everything necessary to work the process, is put up in a neat box, measuring 15 x 11 x 7 inches, and costing in London £3 (\$15). Fresh supplies of the Sinop collotype plates cost from 5 shillings (\$1.25) per dozen for half plate. Under such simple and attractive conditions collotype should become a popular amateur process, and everyone with negatives to print will prefer to do them by this inexpensive method, which enables ordinary paper to be used of any size, and with suitable white margins to

the prints, which, moreover, will be absolutely permanent and may be varied in color at pleasure. A booklet on the subject will shortly be issued, and we invite applications by all who feel interested. Messrs. Penrose & Co. can be addressed at 109 Farringdon Road, London, E. C.



A new business house which promises much usefulness to eastern photographers is the New York Lens Company, with offices at 26th Street and Broadway, New York. This firm will deal in lenses exclusively, buying, exchanging and selling all lenses of standard make, imported or American. The leading spirit in the concern is Mr. O. H. Peck, a dealer of wide experience and high reputation in the northwest. Expert advice and the testing of lenses are to form a prominent feature in the work of the new firm.



Anent the Wynne Exposure Meter note on page 251 of our last number, Mr. G. F. Wynne writes from England as follows: "We have successfully overcome all difficulties with reference to the sensitive paper and standard tints used in our meters. The rapidity of the paper has been considerably increased, and it now colors, under all conditions, to a perfect match with the standard tints on the meter and is quite unaffected by dampness. It is sent out under the name of the Rapid Dead Match Paper.

"Mr. Wenzel, my representative in the United States, has made exhaustive tests of the speeds of all American plates, and the lists now issued are both complete and accurate. These tests have been made with an instrument of Mr. Wenzel's invention which has given uniform and accurate results. These results have been verified by actual landscape exposures."

When desired, the Wynne Meters will be sent on approval for a fortnight. All correspondence should be addressed to Mr. Wenzel, manager of the Infallible Exposure Meter Company, 237 South Fourth street, Brooklyn, N. Y. Mr. Wenzel will put any meter in

perfect working order, fitting it with the new dial, glass, etc., returning it, with the latest speed-card and book of instructions, for the nominal sum of 50 cents.

Plate manufacturers about to issue new products are urged to send sample plates 4 x 5, so that they may be tested and added to the list.



The following note, from the *Times* (New York) gives interesting news concerning a worker whose pictures of animal life have delighted many during the past few years.

A. Radclyffe Dugmore, the artist sportsman and photographer of outdoor life, will, on his return from the Maine woods, contribute a series of elaborately illustrated articles on camping, fishing and hunting to *Country Life in America*, for which magazine he is now engaged to work exclusively. His collection of photographs of birds, wild flowers and native animals, including about 300 negatives, was recently purchased by Doubleday, Page & Co. Mr. Dugmore has written "Nature and the Camera," a book of suggestions on the art of photographing the animate and unposable. He was educated at Guernsey and Smyrna, and studied art at Naples. Lord Brougham is his granduncle.



The exhibit of cameras made by the Rochester Optical and Camera Company at the national convention, Buffalo, was not only typical of the enterprise of this company, but was also thoroughly representative of present-day camera construction. It comprised cameras of every size and style, for all classes of work, their arrangement for convenience of examination reflecting great credit on Messrs. Reilly, Morgan, Robertson and their assistants, who had charge of the exhibit. The center-piece of the display was a model of the Snappa camera, the famous Snappa magazine carrying twelve plates or twenty-four films being automatically operated day after day to demonstrate the practical perfection of its mechanism and movements. This camera, with the others exhibited, may be seen described at

length in the catalogues of the R. O. & C. Co., which our readers can readily obtain on request.



Another instructive exhibit at the convention was that made by Taprell & Loomis, of Chicago, a comparatively new house, which is rapidly making a decided impression in the business of supplying cardboard mounts and similar conveniences for professional and amateur photographers. Apart from the various inclosures, portfolios and folders, particulars of which may be had on request from the firm's offices in Chicago and New York, the special feature of the exhibit was the new Linofil board, a mounting board made of pure linen rag throughout and chemically pure. This is a big improvement over the ordinary mounting board offered photographers, made up of pasted stock of doubtful composition. Those interested in the permanency of their photographs should investigate the quality of this new Linofil board.



The Anthony & Scovill Co. was represented at the convention by an interesting display of cameras, accessories and the like. The prominent feature of the exhibit, however, was a wall display of photographs on Cyko, Actino, Monarch and Royal papers, a fine showing which did honor to the exhibitors. These papers, by the way, are of American manufacture throughout, the paper being made, baryta-coated and sensitized in this country—a fact worth noting by those interested in the development of American industries.



The convention of New England photographers, held in Boston during August, must be recorded as the most successful event of the sort yet held in New England. Over 800 of the most progressive photographers of Massachusetts, Connecticut, Rhode Island, Vermont, New Hampshire and Maine attended the meeting, which was led by President Charles W. Hearn, of Boston. The business sessions of the convention were

devoted to lectures and demonstrations of great practical utility to professional workers. The art exhibit comprised hundreds of carefully selected examples of photography sent by prominent photographers of America, England, Holland, Belgium, France, Italy and Russia. The best of these were displayed in a department known as The New England Salon, acceptance for which is the highest honor in the gift of the association. Mr. Morris Burke Parkinson, of Boston, was elected to serve as president of the association for the ensuing year. He will find it no easy task to sustain the record of the retiring president, Mr. Hearn. A full report of the proceedings, with reproductions of the best pictures exhibited, can be seen in the October issue of *Wilson's Photographic Magazine*.



The exhibit of advertising folders, booklets, cards, etc., at the convention, made by Mr. W. I. Scandlin, 345 Sixth Avenue, Brooklyn, N. Y., was another convention feature worthy of mention. The specialties shown in this exhibit were carefully prepared for their purpose, and we were pleased to see a good-sized crowd around Mr. Scandlin's desk at all times.



Amateur and professional photographers in the northwest are to be congratulated on the great improvement recently made in their two magazines *The Northwestern Photographic Recorder* (Zimmerman Bros., St. Paul) and *Peck's Photographic Poster* (O. H. Peck Co., Minneapolis).

The Photo Budget, published by Charles Loeber, 15 East 17th street, New York, also deserves mention as having effected many improvements in its text and make-up.



Some interesting circulars and a new price list are at hand from the Carbutt Dry Plate and Film Co., Wayne Junction, Philadelphia. Among the novelties we find a new printing paper, Vinco Gravura, with a grained sur-

face, intended for large portraits, landscapes, etc. The samples inclosed with the circulars are very effective and pleasing. Mr. John Carbutt writes that his new Safe Lights—used with the Carbutt Multum in Parvo lantern—are growing in popularity among users of color-sensitive plates.



A realistic photograph of the corner of a room, with a bureau and a kodak in flames, comes to us from Mr. K. E. Blair, Canandaigua, N. Y. Mr. Blair, after reading THE PHOTO-MINIATURE No. 31: *Photographing at Night*, attempted to photograph his bureau by candlelight, using two candles for the purpose. After beginning the exposure he left the room for dinner and returned to find the bureau in flames. The photograph makes an interesting souvenir of the experiment.



The danger attaching to the use of incandescent bulbs, wrapped with non-actinic fabric for dark-room work, is illustrated in the subjoined paragraph from *The British Journal of Photography*.

"A number of 16-candle-power lamps, of the familiar pattern, were enveloped in raw cotton, and very shortly after the current was switched on and the lamps lighted the material began to smoke. When a draught of air was purposely admitted, to see what further would happen, the cotton at once burst into flame. From an examination of the bulbs, it would seem that the heat from the incandescent filaments, not being able to radiate into space, as it would have done had the lamps been left uncovered, accumulated until it was sufficient to soften the thin glass, which caved in, and became hot enough, by its nearness to the filament, to fire the cotton. The careful man will profit by this experience; but it is easy to predict that others will plead that they know the danger, and are not in the habit of placing lamps where they will do mischief. But now that it is such a common practice to use these lamps in connection with leads which can be shortened or lengthened

at will, a lamp can easily by accident be brought into dangerous company. When such a lamp is covered with colored varnish, as is often the case, for use in a photographer's dark-room, the dangers incurred by ignition of surroundings are proportionately increased."

The simplest remedy would be the use of bulbs with red glass, which may readily be obtained from dealers in electrical supplies. We have used such a bulb for years inclosed in the familiar Multum in Parvo lantern made by Carbutt, with great satisfaction.



Corrugated or grooved finger-stalls of thin rubber have been placed on the English market. For many photographic purposes these should prove more acceptable than the slippery, smooth rubber stalls commonly sold by stores.



A writer in the *Photo Revue* gives the following method for obtaining "blue prints" on ivory: Prepare Solution A, 30 grains of ferric oxalate in a dram of water; B, 25 drops of ammonia (.880) "stronger ammonia water," in a dram of water. Mix and immerse the piece of ivory in the solution for fifty to seventy hours, in darkness; then allow the sensitized surface to dry. Printing will occupy about an hour in sunlight. Development is effected with distilled water, 3 drams; potassium ferricyanide, 5 grains; saturated solution of oxalic acid, 20 drops. The development should be followed by abundant washing.

BOOKS AND PRINTS

The editors of *Photograms of the Year 1902* inform us that the preparatory work on this favorite guide to the year's photographs is proceeding very satisfactorily. The book will be made up on the lines so successfully followed in previous issues, but several minor improvements are promised. It is expected that the annual will be ready for delivery in America during December.

Last year *The British Journal Almanac* was completely sold out before publication, although an edition of 20,500 copies was printed. As a consequence of this fact, hundreds of American readers were deprived of their annual photographic feast, and there was much complaining. We are pleased to see that an edition of 25,000 copies of the 1903 issue is promised. The popularity of this "Whitaker" of photography is such that even the larger edition promised should quickly disappear. Wherefore, in the language of the bargain-counter advertisements, we counsel those interested to "come early and avoid the rush."



Messrs. W. A. Mansell & Co., London, W., have published *A List of Photographs*, taken from the original pictures in the public galleries and private collections in Great Britain. This catalogue, which for the first time brings together in one list, and classifies on one system, all the various series of photographs of pictures in Great Britain issued by different publishers, besides small collections hitherto not catalogued, is a reference work of considerable value to picture lovers and collectors. It comprises 83 quarto pages, with 197 illustrations in half-tone. We have found our copy most useful since its arrival. The system of classification and arrangement adopted offers great convenience to the student in search of reproductions of works of art. Price, in London, one shilling and six pence. American collectors can probably obtain a copy by remitting fifty cents to the publishers.



The August number of our California contemporary, *Camera Craft*, is largely devoted to the achievements of women in photography. Although the record is by no means complete, and marred by inaccuracy in proper names (as Mrs. Katherine Weed Barnes, instead of Mrs. Catharine Weed Barnes Ward), the text and pictures of this special issue are unusually attractive. [*Camera Craft* Publishing Company, San Francisco. Fifteen cents.]

Mr. Alfred Stieglitz, 162 Leonard street, New York, sends a prospectus of the new photographic quarterly *Camera Work*, which he proposes to publish in December. The announcement makes extremely interesting reading and should be seen by all who, with the scribe, wish Mr. Stieglitz a large measure of success in his devoted efforts to elevate American pictorial photography.



"Cramer's Manual on Negative-Making," issued for free distribution by the G. Cramer Dry Plate Co., St. Louis, is a booklet of 65 pages containing photographic formulæ and advice from the veteran manufacturer of dry plates, Mr. Gustave Cramer. The fact that the book is made up by Mr. Cramer from his personal experience will commend it to photographers more strongly than any words of ours could do. Copies can be obtained at any of the Cramer depots, and early application will avoid possible disappointment.



Wall's "Dictionary of Photography," one of the best and most complete works of photographic reference available today, has appeared in a new and revised (eighth) edition. This edition has been thoroughly revised and brought up to date by Mr. Thomas Bolas, than whom we know of none better fitted for the task. The book comprises 656 pages, $5 \times 7\frac{1}{2} \times 1\frac{1}{2}$ inches, and, bound in cloth, sells at \$3.75. We cannot forbear pointing out that the complete omission of any mention of THE PHOTO-MINIATURE series from the "Bibliography of Photography," pages 74-80, is a grievous defect, and altogether inexcusable, when it is recalled that several of the monographs in this series are the only works on their subjects available for readers of English.



The Photogram for September admirably sustains the varied interest attaching to this clever magazine. "Hand Camera Work," by Walter Kilbey; "The

Geddis Camera "; "Tone in Photography," by F. C. Lambert; "Foregrounds and the Point of View"; "Lantern Slides in Colors" (from THE PHOTO-MINIATURE No. 38); "The Hat in Portraiture," by F. M. Sutcliffe; "Country Life" (a competition); "Beginners' Troubles," and the usual departments make up the contents of the number. Price 3d, Dawbarn & Ward, Ltd., London. In America 10 cents, Spon & Chamberlain, 120 Liberty St., New York.



The most complete and satisfactory report of the convention of the Photographers' Association at Buffalo, is that given in *Wilson's Photographic Magazine* for September. [Edward L. Wilson, New York. 25 cents.]



The plates and copyrights of these two popular pocketbooks, "Panoramic Photography" and "New Pointers for Amateur Photographers," written and published by George E. Mellen, Chicago, have been acquired by Tennant & Ward, New York, to whom all orders for or inquiries concerning these books should hereafter be addressed.



An important memoir of a photographic pioneer, entitled "Tom Wedgwood, the First Photographer," by R. B. Lichfield, is announced for early publication by Duckworth, of London. Wedgwood was a son of the famous potter of that name, and took a prominent position among the earliest experimenters in photography. The work announced will include Sir Humphry Davy's description of Wedgwood's photographic work. Its appearance will be looked for with interest by all familiar with the evolution of photography.



G. Gennert, 24 East 13th St., New York, has issued an illustrated pamphlet describing the Brouse Flashlamp, by means of which an unusually broad flame of high illuminating power can be obtained. Flashlight workers should not overlook this excellent lamp.

Tennant and Ward's List OF NEW BOOKS AND PUBLICATIONS

THE LADY POVERTY. A XIIIth Century Allegory, telling how St. Francis of Assisi wooed and won that most difficult of all brides, my Lady Poverty. A delightful volume for all interested in Franciscan and mediæval literature. Written A.D. 1227, now rendered into English for the first time. Translated and edited by MONTGOMERY CARMICHAEL. 209 pp. Cloth. *Net*, \$1.75.

AMERICAN PICTORIAL PHOTOGRAPHY. Representative examples of the work of the American School of Pictorial Photography. Selected by and reproduced in photogravure under the personal supervision of ALFRED STIEGLITZ, and formerly published by "Camera Notes." Series I, *net*, \$10. Series II, *net*, \$6. The edition was limited to 150 copies of each series, and only a few sets are obtainable. Descriptive circular on request.

THE "CAMERA NOTES" IMPROVED GLYCERINE PROCESS for the development of platinum prints, including the experiments of ALFRED STIEGLITZ and JOSEPH T. KEILEY. Illustrated with facsimile reproductions in color, by the experimenters. Reprinted from "Camera Notes." Only a few copies obtainable. Paper covers, *net*, \$1.

AN INDEX OF STANDARD PHOTOGRAMS. Being a guide for Authors, Editors and Publishers of Illustrated Books and Periodicals, Collectors of Pictures, etc., listing photographs available for publication purposes. Sold by subscription only. Particulars on request.

PHOTOGRAPHY FOR NATURALISTS. By DOUGLAS ENGLISH. A book for those interested in photographing animals, etc. 132 pp., fully illustrated. \$2.50.

PRACTICAL NOTES ON TELEPHOTOGRAPHY. By BECK LTD. A pocket-book of practical information. Cloth, 25 cents.

[READY IN JULY.]

THE A B C OF PHOTO-MICROGRAPHY. A practical handbook for beginners, by W. H. WALMSLEY. With plain instructions and many engravings. About 130 pp. Cloth, *net*, \$1.25.

PHOTOGRAPHIC APPARATUS, its making and repairing, by various English writers. Cloth, *net*, \$1.

FINISHING THE NEGATIVE. An encyclopedic treatise on all the processes between development and printing. Edited by GEORGE E. BROWN. 160 pp. Cloth, *net*, \$1.25.

THE LENS. A practical guide to the choice, use and testing of photographic objectives. By GEORGE E. BROWN and THOMAS BOLAS. Profusely illustrated. 130 pp. Cloth, *net*, \$1.25.

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Eagles Mere Chautauqua, Pa.,
August 8, 1902.

Dear Mr. Somerville:

I have yours of August 6th, forwarded to me here. I can the more easily tell you what I think of the Cramer plate, as I am seeing every day, in the work brought us at the Chautauqua School of Photography to be developed, what poor results can be attained on plates that are not corrected for color. I can sum up the matter in saying that, while I consider the Cramer Instantaneous Isochromatic plate by far the best for any class of work, it is an absolute essential for the photography of flowers, fruits, plants, trees and other natural objects. I never think of using a screen or ray filter for getting yellow values with this plate, because the plate takes care of them itself, and we also get astonishingly good cloud effects, with white clouds on a blue sky, without a ray filter.

There was a convincing showing today of the Isochromatic quality of this plate. I had a great branch of Tiger Lilies to photograph. The color is a rather warm salmon. Fearing the plate would not handle it properly, I used a ray filter on one exposure. The background was black, but rather strongly illuminated. Of course a fair negative was promptly obtained. Purely for the purpose of demonstration to some of my students, I then gave an exposure on the same subject, with the same lighting, without the ray filter, reducing the time proportionately. To my utter astonishment, the negative obtained from the plate without the ray filter was much better in every respect, giving full and perfect value to the salmon color and at the same time allowing the illuminated black background to come up as desired. On the plate made with the ray filter, the effect seemed to be to hold the black back, so that nothing but clear glass came.

Yours truly,

Mr. E. L. Somerville,
Manager New York Depot,
G. Cramer Dry Plate Co.

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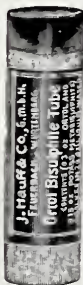
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The final triumph has come. The photographic dark-room is abolished.

The Kodak Developing Machine not only develops film without a dark-room, but does it better than it is done in the dark-room. It widens the photographic field and gives the amateur better results than he obtained before. There are many things which may be done more perfectly by machine than by hand—developing negatives is one of them.

From a physical standpoint the machine gives better results than can be obtained by hand, because it does away with the possibility of foreign substances in the developer settling on the negative and making spots; it does away with the possibility of defacing the negative with finger marks, and it prevents the corners of one negative from scratching the face of another. Chemically the advantages are boundless. In abolishing the dark-room it also abolishes the dark-room lamp. Every experienced photographer knows that in cases of prolonged development the fog from this lamp often becomes serious. The beginner is especially prone to fogging his negatives by examining them too close to the ruby light. He is unable, perhaps, to judge just how far development has proceeded, and, in his anxiety to stop at precisely the right point, he holds them too frequently in front of the lamp and too close to it. He not only strains his eyes and his nerves, but, alas, he often spoils what would, but for his anxiety, have proven a most excellent negative. In the Developing Machine, the negative being in absolute darkness, there is nothing to fog it.

In the Kodak Developing Machine both the film and the developer are in constant motion—the result is quick action on the part of the developer and a brilliant snappiness in the negative that cannot be equaled under the old conditions.

The Kodak Developer Powders contribute their part in making the Developing Machine a success. They are especially prepared for use with the machine, and have as a base pyrogalllic acid, all objection to which is overcome by the fact that when used in the machine the pyro does not come in contact with the fingers.

The first question regarding machine development which will come to the mind of the skeptical photographer will assuredly be: "When there are several unequal exposures on the same strip of film, how are all to be correctly developed, there being no opportunity for individual treatment?"

We, ourselves, before experimenting, felt that the machine might fail under these conditions, but the practical results show that within

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any reasonable limits it does not. The remarkable "latitude" which Kodak film allows in exposure, combined with the constant agitation of the negative during development, with the peculiarly active properties of the Kodak developer powders and the entire absence of fog

(ordinarily caused by the dark-room lamp), upset all theories. The pictures herewith give a practical demonstration on this point. Both were made on one strip of film and were developed in the machine at one time, and neither of them was 'doctored.' They are simply the result of straight development without after-treatment of the negative. Nos. 1 and 2 are

timed exposures; No. 1

was given a sixty-second exposure; No. 2, with the same light and with the same opening in lens, was given six minutes' exposure, or six times as much. In actual practice anyone with a week's experience in picture-taking could judge much more closely than this as to the correct exposure to give. The operator purposely made the over- and under-exposures in order to test the latitude of the film when developed in the machine. No hand-development, no matter how expert the operator, could have secured better negatives from these exposures. Theory is good, but facts are better; the results which the Kodak Developing Machine accomplishes demonstrate that it stands the test of use—it works.

The appearance of an "unfixed" negative held beneath the faint light of a dark-room lamp is deceitful. Leaving out, then, every other consideration, any amateur except one of the widest experience can obtain better results by developing his negatives for *a certain number of minutes* in the Kodak Developing Machine than he can by developing them by hand in the dark-room and trying to judge their density by what he can see under a dark-room lamp.



No. 1. One-Minute Exposure



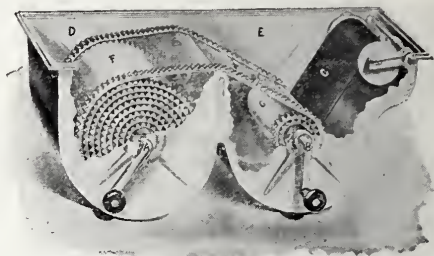
No. 2. Six Minutes' Exposure

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After removal from the Kodak the cartridge of exposed film is inserted in the machine so that the black paper will lead from the top as shown in cut, the celluloid Apron (F-F) having first been wound onto Arbor "A." The gummed sticker which holds down the end of black paper is then broken; the paper pulled out and the end attached to Arbor "B" by slipping under the wire guard. Arbor "B" is now turned to the right until the word "Stop" appears on top of cartridge. Then the end of Apron (F-F) is hooked into Arbor B, after which the developer is poured into compartment "E" and the top put on machine. The operator now turns handle to the right slowly and evenly, until the time of development, about four minutes, has expired. The film (G) winds up inside of Apron but with the face not touching it, thus allowing free action of the developer. As the handle turns freely and easily, this operation is not at all wearisome.



The Machine in Detail

The cover is then removed from the machine; the developer poured off; the fixing solution poured in; the cover replaced and the handle again turned for about four minutes, when the fixing will be complete. After fixing, the cover is again removed, the fixing solution poured off, and after rinsing in two waters the film is removed from machine by taking hold of either the Apron or the end of black paper and pulling out of machine, the film being taken hold of when it appears and pulled free from the black paper.

Nothing now remains to be done except to wash the film, to free it from hypo (fixing solution); wipe it with a soft cloth and pin it up to dry. As soon as dry, the negatives are cut apart and are ready for the print-making to begin.

The machine may be used again immediately. Simply rinse well; wipe the Apron dry and wind it back into Arbor "A." All is now ready for the next roll of exposures.

Not only does the Developing Machine throw light into the dark-room at home, but it enables one to develop his negatives when away from home. *Anywhere that one can obtain cold water and a place to throw waste*, the amateur can operate the Kodak Developing Machine.

The Kodak Developing Machines are thus far made in two sizes. The Style A Machine, for 12 exposure (or shorter) cartridges up to two and one-half inches in length, is for use with No. 0, No. 1 and No. 1A Folding Pocket Kodaks, No. 1 Panoram-Kodaks and the

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Brownie Cameras of either size. The retail price of the Style A Machine is six dollars.

The Style E Machine, for 12 exposure (or shorter) cartridges from three and a quarter to five inches, both inclusive, is for use with the No. 2 and No. 3 Folding Pocket Kodaks, and No. 3 and No. 4 Cartridge Kodaks, No. 2 Flexo Kodaks, the Bullet and Bull's Eye Kodaks of all sizes, the No. 4 Panoram and the No. 2 Stereo Kodaks. The retail price of the Style E machine is seven dollars and a half. In each case the price of machine includes a handsome, natural finished wooden box with leather handle, lock and key, and also a thermometer for testing temperature of developer.

The Kodak Developing Machines may now be purchased of Kodak dealers anywhere in the United States. Further information regarding them will be given upon application to the Eastman Kodak Company, Rochester, N. Y.

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The new device has reduced the whole question of development, to one of a simple handling of material.

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More Than Human

I was about to exclaim, "This is almost human," when I saw the exquisite quality of the machine-made negatives and the certainty of the results. But, after all, it is *more than human*, for few if any experienced photographers would be able to uniformly produce the results I saw and marveled at.

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From a Practical Standpoint

The Kodak Developing Machine will doubtless prove to be a most valuable acquisition to the amateur photographer's outfit. By dispensing with the continued handling, the percentage of failures will be greatly reduced. What matters it if one negative be carried a little further than another? This can be readily be taken care of in the printing.

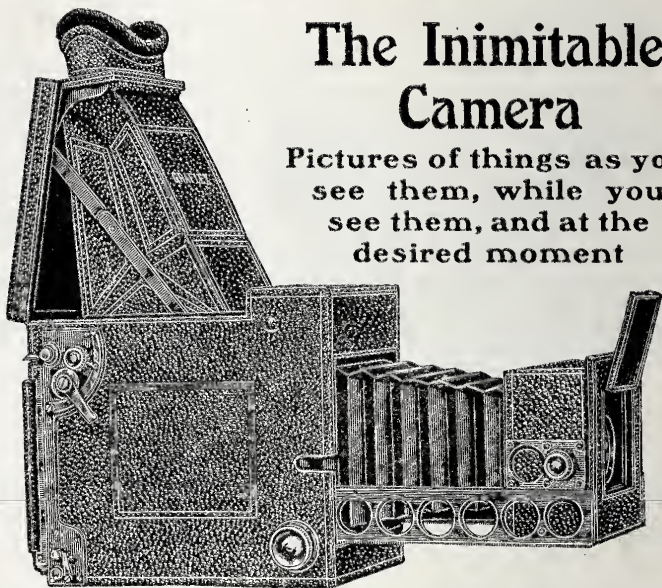
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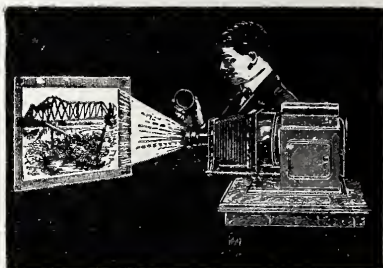
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Water	16 oz.
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Water	16 oz.
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Pyrogalllic Acid	1 oz.
Sulphuric Acid	5 drops

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Water	16 oz.
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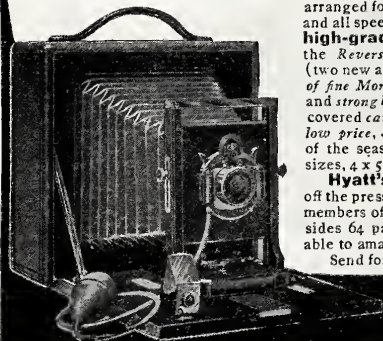
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The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT

Volume IV

OCTOBER, 1902

Number 43

PHOTOGRAPHIC CHEMICALS

Photography is many-sided. It abounds with difficulties and pleasures of the most diverse kinds. But it is always supremely interesting. Looked at from the outsider's point of view, it is equally interesting, whether considered as a mechanical means of reproducing the outward appearances of things visible and invisible, or as a method of pictorial expression which claims for itself a place among the fine arts. The first view opens out its wonderful usefulness in the sciences, the industrial arts and everyday life. The second reveals possibilities which surprise as keenly as they delight the unprejudiced mind. The educator finds in photography a wealth of illustration for the printed page and oral instruction, such as was undreamed of in earlier days. To the chemist photography offers temptingly complex problems as a branch of applied chemistry in which much yet remains to be known. The formation of the picture-image, under widely different conditions and requirements, has engaged the attention of master minds in the science of optics. Similarly, the devising of purely mechanical conveniences in photographic apparatus has attracted the genius of inventors, from Edison to the unknown enthusiast who gave us the first iris diaphragm. Properly told, forsooth, the story of photography would furnish the world with an entirely new series of wondrous tales, rivaling the "Thousand and One Nights" in fascination and interest, but founded on fact in place of the baseless fabric of a dream.

For the majority of us, however, photography is chiefly interesting as a ready means of obtaining pictures or

records of things. Our pleasure in it is, for the most part, measured by our practical success in the making of good negatives and pleasing prints. Here the interest is circumscribed and set within narrow bounds. When the questions of lens, plate and exposure have been answered, success is seen to depend largely on the intelligent use of chemical agents and substances, about which many of us are poorly informed, and in which many more are hardly interested.

**Knowledge
is Power**

It is obviously hopeless to expect success in working with specifically prepared materials without a more or less familiar acquaintance with the nature and properties of those materials. The novice in photography is slow to appreciate this, the simplicity of the festive film and automatic development veiling the prosaic fact concerning "the man behind the gun." But sooner or later the fact asserts itself. He must have definite and certain knowledge of the materials with which he works for certain and definite results. Without this knowledge, the power of modification is unavailable, and in photography modification is often essential to success. How to win this very necessary familiarity with chemical materials, without committing oneself to the dryness and tedium of the average treatise on chemistry, is a question which has puzzled amateurs and professionals since photography began.

**A Chemical
Trio**

The plan adopted in THE PHOTO-MINIATURE series, of conveying this information in small doses, covering a definite field of enquiry in a monograph of reasonable length, has given so much satisfaction that I am persuaded to offer a third monograph dealing with the chemics of photography. In THE PHOTO-MINIATURE No. 18 Mr. Thomas Bolas cleverly presented a connected series of chemical notions covering every-day photography. In No. 23 Mr. George E. Brown followed the trail with plain information about weighing and measuring, making chemical solutions and similar manipulatory details. In the following pages Mr. Brown takes us back a step and, briefly but comprehensively, reviews the chemical agents or substances employed in

photography, their properties and uses. Thus, in the three monographs, the reader possesses a store of chemical information which should prove of direct use in his work as a photographer—for pleasure or profit.

In its first and correct use the word **chemical** is employed as an adjective: pertaining to chemistry. Thus we speak properly of chemical forces, a chemical equation or chemical changes. Later custom has sanctioned its use as a noun, signifying an agent or substance produced by chemical processes for scientific or economic uses. Used in this sense, everything is a chemical or combination of chemicals more or less complex. Says Emerson: "The gases gather to the solid firmament: the chemical lump arrives at the plant and grows: arrives at the animal and walks: arrives at man and thinks." The lesson here for the photographer is that nothing can be considered as utterly inert. Everything is capable of some chemical action, and many a practical problem in photography has its solution in the chemical activity of some unsuspected substance.

The changes which certain chemicals undergo in the light are the mainsprings of photography. At present the chief of these impelling substances are silver, iron and chromium compounds, alone or in combination. We know that silver bromide and silver chloride darken in the light, but this is not the central fact of photography. The mysterious, invisible change which takes place when either of these silver salts suspended in gelatine (e. g., the gelatine dry plate) is exposed to light is the all-important chemical reaction in photography, together with the process of development which makes visible the invisible (or latent) image obtained by exposure. Next comes the visible reaction, which may be observed when light acts on silver chloride *plus* certain organic salts* (e. g., silver citrate) suspended in gelatine or collodion. This visible or "printed-out" image is the basis of many familiar silver printing processes.

* Those salts formed by the action of organic acids on a base are known as organic salts. An organic acid is one of which carbon is a constituent part, as citric acid. In chemistry, bases are those compound substances which unite with acids to form salts, as metallic oxides, etc.

Iron per-salts (ferric salts) pass in the light into ferrous or proto-salts, on which change depend platinotype, Kallitype, the "blue print" and allied processes.

Finally, certain bichromates (ammonium and potass. bichromate) exposed to light along with colloid substances, such as gum, gelatine, albumen and other glue-like bodies, confer upon the latter qualities which make possible the carbon, gum-bichromate, Ozotype, Artigue and similar pigment methods, as well as the method of printing now generally used by photo-engravers and process workers.

The chemicals used in the many operations which make up these processes form a goodly array of substances. For convenience of treatment and reference, these will be grouped together about in the order given below. The summary will also serve to bind the groups together and, at the same time, give the reader a general idea of the scope of the monograph and its arrangement.

Water in relation to chemical agents.

Alkalies: soda and potass. carbonates; caustic soda and potash; ammonia and ammonia carbonate.

Acids: hydrochloric, sulphuric, hydrofluoric, acetic, phosphoric, citric, nitric, and their important salts.

Developers: pyro, hydroquinone, metol, amidol, eikonogen.

Sulphites ("preservatives"): sulphurous acid, soda sulphites, potass. metabisulphite, acetone-sulphite.

Sodium thiosulphate or hypo.

Chromates: potass. and ammonia dichromates (pigment printing, toning and bleaching).

Silver salts: nitrate, ammonio-nitrate; residues.

Gold: chloride.

Platinum salts: bichloride and chloroplatinite.

Ammonium and potass. bromide (restrainers); potass. iodide.

Mercury salts: perchloride, subchloride and its changes; iodide; cyanide.

Copper salts: sulphate, bromide (intensifier); ferricyanide (toning).

- Iron salts: proto-sulphate and oxalate; perchloride; ammonia-citrate (brown and green); ferricyanide and ferrocyanide (reducer and in "blue" printing).
- Lead salts: nitrate, acetate (toning); ferricyanide.
- Uranium salts: nitrate, acetate, ferricyanide (printing, toning and intensifying).
- Alums: soda, potass. and ammonium, chrome.
- Cyanides and sulphocyanides: potass. (fixing, etc.); ammonium, and gold (toning).
- Mountants: starch, gelatine, gum, fish-glue, dextrine (these considered as "sizes").
- Backing chemicals: caramel, asphaltum.
- Antiseptics: mercuric chloride, thymol, formalin.
- Dyes: picric acid, aurantia, eosin, erythrosin, cyanine, tartrazin (ortho-plates, light filters).
- Hypo eliminators: percarbonate, persulphate periodate.
- Combustibles and combustants: magnesium and aluminum; potass. nitrate, perchlorate.
- Decolorizers or "anti-stains," bleaching powders, etc.
- Resins: shellac, gum dammar, elemi, mastic, sandarac, amber.
- Solvents of resins: benzene, chloroform, amylacetate, alcohol.
- Odd organic chemicals: glycerine, paper (mounts), celluloid.
- Odd inorganic chemicals: persulphate, permanganate, Schlippe's salts, ceric sulphate, liver of sulphur, ammonium molybdate, talc, iodine.
- Testing chemicals, acids and alkalies.
- Poisons: symptoms and antidotes.

Water and Chemicals The chemical primer tells us that water is a combination of the two gases, oxygen and hydrogen, the formula being expressed in chemical shorthand as H_2O . Experience adds, however, that the average water supply departs from this standard of purity and contains substances or impurities which may interfere with normal results in our photographic work. Pure water is especially desirable for all stock or chemical solutions; for washing negatives or prints the ordinary supply will generally meet all needs except where obviously con-

taminated with alkalis or other harmful additions. The impurities usually found in water are: (1) dissolved air, (2) dissolved carbonic acid gas, (3) salt, i. e., sodium chloride, (4) lime and other calcium salts, also magnesium salts, (5) organic or vegetable matter, and (6) traces of iron or sulphur.

Air Water containing dissolved air or gas will cause bubbles or air-bells on plates and papers manipulated in solutions made with it. It also affects the "keeping" quality of developers such as pyro, protosulphate of iron and other chemicals which readily oxidize. Air is a common but often unsuspected source of trouble in water, and the boiling and cooling of any sample intended for the making of chemical solutions of all kinds is a desirable precaution. Boil five minutes in a clean iron enameled pan, or other open vessel, and allow it to cool without shaking or other disturbance.

Gas Carbonic acid gas (carbon dioxide, CO_2) plays a curious part in water, the effect of which has probably been observed by everyone who has made a soda or potash solution. Water free from carbonic acid gas dissolves chalk (calcium carbonate, CaCO_3) only very slightly, about two grains of chalk per gallon of water. But when the water contains carbonic acid gas, as almost all natural water does, it dissolves chalk freely, up to about one part of chalk in a thousand parts of water. When the carbonic acid gas is expelled by boiling the water, or is absorbed by chemical means, the chalk precipitates. This is what happens when such water is used for making up solutions of caustic alkali, the latter combining with the gas. Hence in preparing solutions of caustic soda or potass. boiled water is preferable.

Lime Lime salts (sulphate of lime or gypsum, calcium chloride and nitrate) occur in many waters, and are troublesome in making solutions of potass. oxalate, potass. phosphate or other phosphates and oxalates. A white precipitate of oxalate or phosphate of lime falls and must be allowed to settle or be filtered off before the solution is used. The carbonates of soda and potash also give a precipi-

tate of carbonate of lime similar to that obtained in the case of caustic potash mentioned above, but derived from lime in a different state in the water.

Salt Salt, or sodium chloride, present in almost all waters, contains chlorine, and therefore gives a white turbidity or precipitate when silver nitrate is added. Lead salts give a similar effect, but not if the proportion of sodium chloride is very small. There is no remedy except to filter, after shaking well to coagulate the silver or lead chloride which will otherwise run through the filter paper. The best plan, however, is to use distilled water for such chemicals.

Organic Impurities Organic impurity should be absent from all water intended for drinking purposes. Its presence may be denoted by color in the water, but not necessarily, some impure waters being clear and bright. A test for such impurities is to add a little very weak solution of potass. permanganate *plus* a drop or two of dilute sulphuric acid. The water should be faintly pink after this addition. If the water is impure the color will be discharged in a few minutes. Such water is especially unsuitable for toning baths, or stock solutions of gold or potass. chloroplatinite. Distilled or pure spring water should be used for this purpose.

Rain-Water The purest water which occurs in nature is rain-water, but this does not mean that all rain-water is pure or suitable for photographic uses. Rain-water collected in towns often contains ammonia and organic impurities dissolved from the atmosphere, to say nothing of organic matter washed from the roofs of houses. In collecting rain-water for use in photography, therefore, take that which comes in a heavy shower, but after the atmosphere and housetops have been well washed.

Distilled Water Wherever possible, distilled water should be used for all chemical solutions. This can be obtained at small cost from the nearest drug store, or a home-made "still" can be improvised with a little ingenuity. Where distilled water is not readily obtainable, the

water should be vigorously boiled, allowed to cool, and filtered. By care in this detail many of the difficulties met with in every-day manipulation can be avoided.

What are alkalies? Very briefly, sub-

Alkalies stances possessing the power to neutralize acids and form salts with them, as the hydrates of sodium, potassium and ammonium. The alkalies are readily soluble in water, imparting to it a slimy feel owing to their corrosive or solvent action on the skin. They change the tint of many vegetable coloring matters, e. g., restore the blue color of litmus paper which has been reddened with an acid. They also unite with certain saponifiable oils to make soap, which fact explains the usefulness of the alkalies for cleansing purposes.

In photography the alkalies are largely used in development, most of the modern developers requiring the addition of an alkali to affect the latent image. Here, however, they are not used as neutralizing substances, but to energize and give impetus to the developing agent proper. This is more fully explained in THE PHOTO-MINIATURE dealing with developers. Photographers also use alkalies to neutralize acid solutions and to secure an alkaline condition in toning baths, etc. Alkalies are of two kinds, caustic and carbonate. The caustic alkalies—caustic soda, caustic potash, etc.—are much more energetic bodies than the carbonates, and can only be used with certain developing agents. Their corrosive action on the skin and clothing renders care essential in their use. It has been found, for instance, that the skin irritations experienced in the use of some developers are due, not to any harmful property in the developing agent, but to the nature of the alkali employed with it. The frequent dipping of the finger-tips in a weak acid solution while using alkalies will tend to obviate this trouble. Rubber finger-tips or gloves are also more or less efficacious, although troublesome. Potash, soda and lithia are sometimes spoken of as *fixed* alkalies, in contradistinction to ammonia, which is known as *volatile* alkali—for obvious reasons. Ammonia, however, is rarely used in development, as will be explained in a later paragraph.

Caustic Potash Described also as potass. hydrate and potass. hydroxide, with the formula KOH , is sold in the form of white sticks ("pure stick"), obtained by fusing the substance and casting it in iron moulds. This is the variety generally used in photography. "Caustic potash by alcohol," which comes in white lumps, is a much purer product. Both varieties are extremely deliquescent and must be kept in tightly corked bottles. KOH is freely soluble in water, its solution sometimes developing sufficient heat to crack bottle or graduate. In dry form or solution it should be kept in rubber-stoppered bottles, as it attacks glass and cork. Care should be used to prevent fragments flying when breaking the "stick," as these will leave a hole where they alight on skin or clothes. With ordinary water caustic potash does not give a clear solution, as explained under "Water," which see. [POISON.]

Caustic Soda Also known as sodium hydrate and sodium hydroxide, NaOH , resembles caustic potash in its general properties, but is less soluble. See table at end of poisons of monograph. [POISON.]

Carbonate of Soda The importance of this alkali in photography, and the wide variation in quality exhibited by commercial samples, mark it as worthy of consideration in detail. In its strongest form carbonate of soda is known as anhydrous sodium carbonate, with the formula Na_2CO_3 . It comes as a white granular powder, and is sometimes spoken of as "dry" or "dried" carbonate, anhydrous meaning free from water. Dry carbonate is not generally used by photographers, but is preferred by some, since its exact strength can be assured by heating it in a basin over a spirit lamp, any moisture being so driven off. As a general thing, commercial varieties of "dry" carbonate are reliable in strength. Dr. C. W. Miller, in a recent report to the Photographic Society of Philadelphia, mentions a sample chosen at random which he found to contain 91.3 per cent of Na_2CO_3 . As the anhydrous salt readily absorbs 10 per cent of moisture, it should be kept in well-stoppered bottles. Na_2CO_3 contains

two and two-thirds as much real carbonate as the "crystals" variety. Carbonate of soda, as commonly used in photography, is variously described as sal soda, washing soda and sodium carbonate (crystals or granular). In theory this should have the composition $\text{Na}_2\text{CO}_3, 10\text{H}_2\text{O}$, each molecule of Na_2CO_3 taking ten molecules of water in crystallizing, and is supposed to contain 37.7 per cent of Na_2CO_3 . Different varieties, however, will differ in their percentages as the salt loses water when exposed to dry air. Dr. Miller, in the report mentioned, gives alarming figures showing the variable nature of average commercial samples examined. His percentages of Na_2CO_3 are 68.6, 43.5, 50.3. Such samples are probably more common in the dry air of America than in England, where sodium carbonate (crystals) often contains less than 37.7 per cent of Na_2CO_3 . When the cheaper varieties are used, such as washing soda or the sal soda of the grocery, it should be washed and the clear, transparent crystals only used. Properly, the crystals should dissolve to a clear solution in distilled water. Some samples contain alumina, dirt and other impurities. The Seed carbonate styled "Chemical Pure" is perhaps the most reliable variety available in this country, and has about twice the strength of the average sample. It comes in a loose mass of minute crystals and gives a clear solution in any water of average purity. All varieties of sodium carbonate should be kept well stoppered, not, as is usual, to keep the salt dry, but to retain the correct proportion of water. Solubility, 50 per cent. Sodium bicarbonate (NaHCO_3) often sold by grocers and druggists as "carbonate" in the form of a white opaque product, is quite useless in development.

Potassium This salt is obtainable in "dry" or
Carbonate anhydrous and "crystallized" varieties.

The former should be used in photographic formulæ, as the crystallized salt is very uncertain in composition. Dry potass. carbonate has the formula K_2CO_3 , is extremely deliquescent and quickly becomes a pasty mass if exposed to the air. It is extremely soluble. One hundred parts of water will dissolve 109 parts K_2CO_3 . Potass. carbonate, crystals, has

the formula $K_2CO_3-2H_2O$, and an average sample will contain from 76 to 85 per cent of the real (dry) salt. By some workers potass. carbonate is preferred before sodium carbonate for development, but the advantages are not readily perceived in practical work. I make room for a word on this point from Dr. Chas. L. Mitchell. It is interesting as giving information on the moot question of the comparative action of the different alkalis used in development. He says:

**The Action
of Different
Alkalies**

In examining the action of the different alkalis with the developing agents, we find a very marked difference. Take pyro, for example. It works almost equally well with both sodium and potassium carbonate, probably more energetically with the potassium salt. The use of a caustic alkali, however, with pyro, is entirely out of the question, as it produces immediate fog. On the other hand, hydroquinone works better with the caustic alkali than it does with the carbonate salts; and furthermore, there is a very marked difference in the action between potassium carbonate and sodium carbonate. If equivalent quantities of sodium and potassium carbonate are taken, and noticing their action when using equal quantities of hydroquinone with each, it will be found that development begins much more speedily with the potassium salt than with the sodium salt; in fact, the sodium salt is so slow as to be comparatively useless. This property is taken advantage of in several well-known preparations on the market. If you will examine the hydroquinone developing powders put up by the Eastman Kodak Company, you will find that the contents of the two packages consist of pure hydroquinone in one and crystallized sodium sulphite and potassium carbonate in the other. This is the reason why it is necessary to wrap them in wax paper and tin foil, as the potassium carbonate absorbs moisture from the air and very rapidly deliquesces. Taking a developing agent which represents the other and extreme end of the scale from pyro, that is, amidol, we find that such a small quantity of alkali is required to put it in effective operation that the low alkaline nature of ordinary crystallized sodium sulphite

furnishes sufficient power, and no other alkali is necessary, although generally added.

There is another question which may interest you, and that is, when using alkalies in developing you may wish to know how many grains of the different

alkaline salts are equivalent to one another. That is, if you are using a certain number of grains of sodium carbonate in your developer, it might be of interest to you to know how many grains of potassium carbonate you should use in order to produce the same effect. There is a little table which is quite valuable in regard to this, which has been compiled by O. G. Mason. I append it here. Equal work is done by—

112	parts of potassium hydrate,
80	“ “ sodium hydrate,
165	“ “ potassium carbonate,
106	“ “ sodium carbonate (dry),
286	“ “ sodium carbonate (crystals).

When “ammonia” is specified in photographic formulæ the strongest liquor ammonia (.880) is meant, although

the average sample is rarely stronger than .890 sp. gr., containing about 33 to 35 per cent of the gas (ammonia NH_2). The solution has the extremely powerful odor of ammonia and should be cautiously handled, as the vapor irritates the eyes, nose and throat. Formerly used in England as an alkali in development with pyro, ammonia .880 is now largely discarded because of its volatile nature. It loses strength rapidly when strong, and should be mixed with an equal quantity of water when purchased, double the quantity called for in the formula being used as occasion requires. [POISON.]

This is the “rock” or “lump” ammonia of the drug stores, and is a mixture of several salts of ammonia, unstable and subject to change in composition. The normal carbonate has the formula $(\text{NH}_4)_2\text{CO}_3$. It is a strong alkali, soluble to 25 per cent in cold water (hot water should not be used to dissolve it), and it should be kept well stoppered. Its use is advised with pyro and hydroquinone for obtaining warm tones in

transparencies and lantern slides. Such tones are permanent despite the oft-repeated statement to the contrary.

All acids are alike in possessing the power to neutralize alkalies, losing at the same time their own distinct character and forming salts. They are very different in appearance and other properties. The following are those acids commonly used in photography:

Hydrochloric Acid This, otherwise known as muriatic acid, is an aqueous solution of the gas HCl, and is largely used as a "fixer" or clearing solution in platinum printing. This it does by removing the iron from the print. The chemically pure acid should be colorless, with a density of 1.19 to 1.21, corresponding to 38-42 per cent by weight of HCl. It is a strongly fuming liquid, and its vapors are very irritating to the eyes, nose and throat. The variety labeled "muriatic acid" is a cheaper and often less reliable product. Added to a solution of alum, hydrochloric acid forms a valuable clearing bath for negatives. A formula for this is: Alum, 1 ounce; hydrochloric acid, $\frac{1}{2}$ ounce; water, 20 ounces. With nitric acid, it dissolves gold and platinum, the mixture being known as *Aqua regia*. An impure variety of the acid, known as spirits of salts, contains sulphuric acid, arsenic, iron and other impurities. This variety, diluted with an equal quantity of water, is useful as a cleansing agent in the dark-room. It rapidly dissolves all mineral deposits in bottles, distils and the like. [POISON.]

Sulphuric Acid An oily-looking liquid nearly twice as heavy as water, with a specific gravity (density) 1.84=95 per cent H_2SO_4 . In its purest form obtained by distilling oil of vitriol. Intensely acid and corrosive in its action on the skin, clothes, cork and many organic bodies. Should be kept in a stoppered bottle and handled with extreme care. When mixed with water great heat is developed, with, if the water be added to the acid, explosively violent bubbling. *The acid must always be added to the water* a drop at a time: never *vice versa*. A mixture of equal parts of water and sulphuric acid *plus* a

few crystals of potass. bichromate forms one of the best cleansing liquids where the dirt to be removed is organic, such as dyes, gelatine, starch, etc., but this liquid must be handled with great care. When sulphuric acid is named in formulæ as "parts," parts by weight are usually intended. One minim of the strong acid is equal to about two grains by weight. The strong acid absorbs water if left exposed to air, and a solution thus exposed for a few days would decrease in strength one-half or one-third in a damp atmosphere. Sulphuric acid is used to liberate other acids from their salts, e. g., sulphurous acid from sodium sulphite, hydrofluoric acid from sodium fluoride, etc. [POISON.]

A colorless, fuming liquid which will
Nitric Acid burn the skin and color it a brown-red.

An intensely irritant poison, which should be handled with the utmost care. The average commercial variety has sp. gr. of $1.2=33$ per cent by weight of real acid HNO_3 . Sometimes the strong acid is yellow in color; this is not an indication of impurity but is due to exposure to light. Nitric acid is used as a preservative of solutions of pyro (10 drops of acid per ounce of pyro in 6 ounces of water is a reliable formula). With HCl nitric acid forms *Aqua regia*, already mentioned. It is also used in making pyroxylin for collodion. [POISON.]

The commercial acid bearing this
Hydrofluoric Acid name is a solution of the gas HF in water. It resembles hydrochloric acid in appearance, is strongly corrosive and forms dangerous sores when brought into contact with the skin. Its fumes are exceedingly harmful and should not be inhaled, for which reason it is best handled out of doors or in a fairly strong current of air. It attacks glass and must therefore be kept and manipulated in guttapercha bottles and containers. It is used for stripping the gelatine film from its glass support, and for etching glass. [POISON.]

This is sold in three varieties, of
Acetic Acid which the strongest, known as "Glacial Acetic Acid," is invariably meant in photographic formulæ unless the contrary is stated. It

is a colorless liquid of pungent odor, and solidifies at 17°C (62°Fahr.) = 98 per cent of real acid, $\text{HC}_2\text{H}_3\text{O}_2$, the percentage of acid present being determined by its solidifying point. "Commercial Acetic Acid" is equal to glacial *plus* twice its volume of water, containing from 30 to 33 per cent of real acid. Glacial *plus* seven times its volume of water constitutes the "Dilute Acetic Acid" of the drug-store and contains about 5 per cent of real acid.

Glacial acetic acid blisters the skin in a short time. It has a softening action on gelatine and is therefore used: in uranium toning, to counteract the toning of the film; and preparatory to treating old and hardened negatives by chemical means. Added to gelatine solutions it produces an adhesive which remains liquid when cold, but such a mixture is useless as a photographic mountant.

When exactly neutralized with caustic soda, acetic acid forms the salt known as sodium acetate, $\text{NaC}_2\text{H}_3\text{O}_2$, chiefly used in gold toning baths. It is a very soluble salt, dissolving in three times its weight of cold, and in its own weight of hot water.

According to an "Elementary Chemistry for Photographers" recently published: "Citric Acid is an acid principally obtained from lemons." We must push our inquiries a little further than this. As an acid it is used as a preservative in pyro solutions (pyro, 1 ounce; citric acid, 40 grains; water, 10 ounces); for improving the keeping properties of the ferrous sulphate solution used in iron development; with alum and ferrous sulphate in clearing baths; and in the preparation of gelatine-chloride emulsions. It is also used to form citrates, and is useful as a preservative of sensitized papers. Its solubility is 133 per cent in cold, and 200 per cent in hot water.

Ammonium citrate, with the formula
 Citrates $(\text{NH}_4)_2, \text{H}, \text{C}_6\text{H}_5\text{O}_7$, is a very soluble salt made by neutralizing citric acid solution with strong ammonia; each ounce avoirdupois of crystallized citric acid requires about 250 minims of liquor ammonia .880 and produces about 500 grains of

ammonium citrate. The salt is so deliquescent that it can be kept only in solution. It is a very valuable restrainer in the development of over-exposed plates. Dose: 6-10 grains per ounce of pyro developer.

Sodium citrate, $\text{Na}_3\text{C}_6\text{H}_5\text{O}_7$, $5\frac{1}{2}\text{H}_2\text{O}$, is made by neutralizing citric acid with sodium carbonate. To make 480 grains of sodium citrate, take 282 grains of citric acid, dissolve and add sodium carbonate (crystals) until the acid solution is neutralized. About 580 grains of soda crystals will be required to effect this.

Potassium citrate is prepared in a similar way, using for 480 grains of the potassium salt 310 grains of citric acid and about an equal weight of dry carbonate of soda.

Citrate of soda or potash is a powerful solvent of many compounds which yield to no other agent, and is thus a very valuable chemical. For example, copper ferricyanide dissolves in it, hence, Ferguson's toning process mentioned under copper salts. The experimental reader is referred to the Journal of the Chemical Society (London), 1857, for the original report of the multifarious functions of these citrates communicated by Mr. John Spiller.

$\text{H}_2\text{C}_2\text{O}_4$, $2\text{H}_2\text{O}$ is used as a "preservative" of pyro solutions (5 to 10 grains per ounce of pyro), and as a preventive or remover of yellow stains in bromide printing. A 12 per cent solution can be made in cold water. It is poisonous, 60 grains being often sufficient to cause death. [POISON.]

Potassium Oxalate Also known as "neutral oxalate of potash," has the formula $\text{K}_2\text{C}_2\text{O}_4$ and should be in perfectly colorless crystals, the solution of which should be neutral. A slight acidity (reddening of blue litmus paper) may be admitted, but alkalinity ("bluing" of red litmus paper) is a sign of a bad sample. Such a sample used either for iron development or in the platinum process will cause failure: in each case by reason of a staining iron compound being deposited on the bromide or platinum paper. The solution must be made just faintly acid, which can be done by adding a weak solution of oxalic acid till



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blue litmus just turns red. Potass. oxalate causes much turbidity when dissolved in ordinary lime containing water (see "Water"). Unless distilled or boiled rain-water is used, the solution must be let settle and the clear liquid poured off. It is better to do this than to filter, as the precipitate is very fine and at first passes through the filter, to afterwards choke up the pores of the paper so that filtration is very slow.

The salt dissolves in three times its weight of cold water, more freely in hot water, which latter is best used in making up solution. "Strong oxalate solution" is made by dissolving 1 part of neutral oxalate in 3 parts of water. This should have sp. gr. 1.159 at 60° Fahr.

A remarkable property of potass. oxalate is its bleaching action on Prussian blue. It discharges the color of "blue" prints almost instantly and is used for writing titles on the blue grounds of engineers' sun copies. Formula, the exactness of which is important: Potass. oxalate, 1 part; water, 6 parts.

There are two other oxalates of potash—the acid oxalate or binoxalate and the quadroxalate, both much less soluble than the neutral oxalate and both strongly acid. Both (or a mixture of both) are sold as "salts of lemon" or "salts of sorrel" for removing ink stains. [POISON.]

This is very soluble (10 parts in 6½ parts of water). It is a constituent of certain iron printing sensitizing solutions, especially those containing iron and silver nitrate, which are sold under various fancy names for the home preparation of printing paper (see under "Iron Salts"). The value of tartaric acid and its salts lies, like citric acid, in the solubility they confer on iron compounds. When ammonia or other alkali is added to an ordinary salt of iron, such as ferric chloride, a precipitate of oxide of iron combined with water is formed and the liquid becomes red and opaque. But if citric or tartaric acid be present the liquid remains clear even when strongly alkaline. Hence the use of citrates and tartrates in developing solutions in iron process (see Kallitype, under "Iron Salts" later).

Rochelle salt is the most important tartrate. It is a double salt of potassium and sodium. In combination

with silver nitrate in gelatine or collodion print-out emulsion papers, it forms silver tartrate, which gives strength or brilliancy to the prints. Added to the ferrous oxalate developer, Rochelle salt, according to Hauberrisser, greatly improves the keeping properties and enables a one-solution iron developer to be made.

When pure this comes in white, needle-shaped crystals, but it is often of a brownish tinge. One part dissolves in 100 parts of cold water, or 3 of boiling water, or 12 of glycerine, or 5 of alcohol. It is used in black line engineers' paper and as a developer of lightly exposed print-out paper.

is not really an acid and is more properly called tannin. One part dissolves in about 1 part of either water, alcohol or glycerine. Tannin hardens gelatine as alum does but is not of much practical use, as it stains; it likewise forms a black compound (really the old-fashioned ink) with iron "black line" processes.

This is sold as a syrupy liquid, the density of which for various percentages of real phosphoric acid (H_3PO_4) is: 100 per cent, 1.887; 80 per cent, 1.648. 60 per cent, 1.440; 50 per cent, 1.349; 30 per cent, 1.189; 20 per cent, 1.120; 10 per cent, 1.057. When "phosphoric acid" is prescribed in formulæ the strongest syrup is meant. Chiefly used in platinum toning baths; also in Willis' aniline process. Pyro developers containing it are said to give a brown-colored negative or positive.

Sodium phosphate should be neutral. The crystals lose water when exposed to dry air, becoming white and opaque, and a complex phosphate is formed. It should, therefore, be kept in well-stoppered bottles. Solubility: 25 per cent in cold water; 50 per cent in hot water. The salt is chiefly used in toning baths.

This salt, recommended by Lumière as a substitute for alkalies in development, is said to give stronger images than the carbonates. This does not yet seem to be demonstrated in practice. The salt has the composition $Na_3PO_4, 12H_2O$.

In this monograph it is not possible to detail the chemical properties of the many developing agents, nor would such information be of much service. I have only space to classify the chief developers as regards certain important properties. Those who desire fuller information should consult Dr. Andresen's Table of Reactions ("British Journal Almanac," 1902).

Work with sulphite only:—amidol, diamido-resorcin, tri-amido phenol, metol.

Work with carbonates plus sulphite:—amidol, pyro-catechin, eikonogen, glycin, hydroquinone, pyrogallol, metol, ortol, para-amido phenol.

Work with caustic alkalis:—diphenal (not soluble in alkaline carbonate) glycin, hydroquinone, para-amido phenol, paraphenybendramine.

Precipitated from aqueous solutions by strong hydrochloric acid:—amidol, diamido-resorcin, eikonogen, para-amido phenol, paraphenybendramine, tri-amido phenol. There are other reactions.

The various substances containing more or less sulphurous acid, SO_2 , are very important, as, next to hypo, they are the most used of all photographic chemicals. Their relative value depends mainly on the percentage of sulphurous acid they contain.

A solution of the gas SO_2 in water, used as a "preservative" in pyro solutions and sometimes prescribed in developing formula, e. g., in the Beach potash developer. The strong solution should have sp. gr. of 1.046, and then contains $9\frac{1}{2}$ parts of real acid (SO_2) per 100 parts by weight of liquid. This preparation soon loses strength by oxidation, changing to sulphuric acid, and is not a desirable substitute for sodium sulphite. Its fumes are extremely irritating, and its suffocating odor is objectionable.

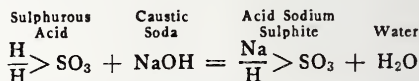
A monograph on sulphite of soda is among the things most desired by photographers. Some day we may attempt it in this series.

The salt occurs in the crystallized and anhydrous

form with the formulæ $\text{Na}_2\text{SO}_3 \cdot 7\text{H}_2\text{O}$ and Na_2SO_3 respectively. Sodium sulphite (crystals) should be neutral. This is invariably stated, but as invariably misunderstood. The term neutral, as herein used, refers to the chemical constitution of the salt, and not to its behavior with litmus paper. Mr. M. B. Punnett explains the detail as follows:

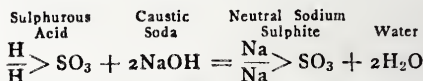
Sulphurous acid has two atoms of hydrogen which can be replaced by an equivalent base or metal.

If we replace one of these atoms of hydrogen by an equivalent amount of the metal sodium we have acid sodium sulphite.



Acid sodium sulphite, or, as it is commonly called, sodium bisulphite, reacts acid with litmus paper, but is called acid because it has still left an atom of hydrogen which can be replaced.

If we replace both atoms of sulphurous acid with sodium, we have neutral sodium sulphite.



Neutral sodium sulphite reacts alkaline to litmus paper, and is called neutral because the two replaceable atoms of hydrogen in the acid have been replaced by an equivalent amount of metal; that is, its affinity is neutralized or satisfied.

A similar relationship exists between carbonic acid and sodium bicarbonate and carbonate. In this case the bicarbonate (also called acid carbonate and baking soda) reacts alkaline, and the carbonate (also called neutral carbonate, sal soda and washing soda) is strongly alkaline, as you all know. It is impossible to make neutral sodium sulphite acid, for if it is crystallized from a solution made strongly acid with sulphurous acid, the pure crystals react alkaline.

From these examples the inference must not be drawn



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that all chemically neutral salts react alkaline; on the contrary, there are some that test neutral and others that test acid.

Cryst. sulphite should be in clear, transparent crystals. A white powdery appearance denotes an impure salt, the result of bad manufacture or long keeping. The deposit is sulphate of soda, produced by air acting on the sulphite, and besides lowering the percentage of sulphurous acid has an injurious effect on developers. Very often the sulphate is only a thin crust on the surface, and by rinsing the crystals with a little water they become clear and bright. This should be done, the wet fragments being dried between blotting paper and weighed out. When soda sulphite is placed in hot water for dissolving, it suddenly becomes opaque and similar in appearance to the impure salt; but this is merely due to the removal of the water of crystallization from the salt: the very best sulphite will behave in this way.

Stock solutions of all sulphite preparations should be kept in well-corked bottles, preferably filled right up to the mouth; the solid salts also require to be kept excluded from the air. Ancient authorities limit the solubility of soda sulphite of soda to 25 per cent, but a 50 per cent solution can be made and does not deposit crystals unless cooled much below 60 degrees Fahr.

Anhydrous soda sulphite keeps in good condition better than the crystalline salt when in the solid state; there is no difference between them in solution. One part of "anhydrous" equals two parts of "cryst." sulphite in preservative properties, i. e., contains twice as much SO_2 .

To test either salt for purity, add a little pure hydrochloric acid to a solution and then a few drops of barium chloride solution. A milkyiness or precipitate denotes the existence of sulphate. The phenol-phthalein tests (see elsewhere) shows alkali.

Sodium acid sulphite (NaHSO_3) is formed by passing SO_2 into a strong sodium sulphite solution, which thereupon becomes strongly acid. It is largely used in the preparation of acid fixing baths, acting as a decolorizer, and in pyro solutions. Its composition is even

more unstable than the neutral salt, and it should not be used in preparing single solution developers.

Potassium Otherwise, pyrosulphite is $K_2S_2O_5$
Meta- and contains 54 per cent of SO_2 . The
bisulphite crystals oxidize more slowly than sulphite and the salt is in every way an

excellent preservative of pyro. But it is acid, and when used to replace soda sulphite in a formula the alkali must be increased. The extra amount can be found thus: For every grain of potass. metabisulphite in a given liquid as used extra weight of alkalies as follows must be added; Caustic potash, 5 grains; caustic soda, .36; potass. carbonate (dry), .62; sodium carbonate (dry), .48; sodium carbonate (cryst.) .96.

Acetone This is a compound of anhydrous
Sulphite soda sulphite and acetone, and contains
when pure 46 per cent SO_2 . It is very soluble—up to a 50 per cent solution—and does not seem to oxidize so rapidly as sulphite. Quite recently introduced, many useful properties are claimed for this compound, both as a “preservative” for developing and fixing baths, and as a restrainer in case of over-exposure. It comes in white crystals, and in solution has no odor, showing a faintly acid reaction.

In developing solutions 15 parts of acetonesulphite (Bayer) are said to replace 100 parts of sodium sulphite crystals, or 5 parts acetonesulphite (Bayer) will replace $3\frac{1}{2}$ parts of potassium metabisulphite.

In fixing solutions 100 grains acetonesulphite (Bayer) added to each quart of hypo solution will keep it clear and colorless for weeks. When developers are used which color the fixing bath brown (as pyro), 150 grains of acetonesulphite should be used as above.

As a restrainer acetonesulphite (Bayer) is used in the form of a concentrated stock solution (50 per cent), added drop by drop to the developing solution as needed. Twenty-five to 30 drops added to 4 ounces of developer are sufficient for extreme over-exposure.

Sodium thiosulphate, $Na_2S_2O_3 \cdot 5H_2O$
Hypo is the fixing salt familiar to all. Solubility: 1 part in $1\frac{1}{2}$ of water. Should be in clean, colorless, transparent crystals dissolving

to a liquid free from milkiness. Acids and alums decompose hypo and precipitate sulphur, forming a number of sulphur compounds, among which is hydrogen sulphide, H_2S . For this reason alum-hypo fixing baths are not recommended. A so-called "acid" fixing bath which is free from objection is: Hypo, 4 ounces; potass. metabisulphite, $\frac{1}{2}$ ounce; water, 20 ounces. There the acid is supplied by the metabisulphite (an acid salt), but as the bath oxidizes no free sulphuric acid can attack the hypo, since it is taken up by the metabisulphite, potass. sulphate being formed and sulphurous acid (which does not decompose hypo) being liberated. The virtue of hypo as a fixer depends on its solvent powers, silver chloride, bromide and iodide, which it converts into a double salt of silver and sodium soluble in water, $Ag_2S_2O_3, 2Na_2S_2O_3$. If a plate is removed too soon from the bath, or if too weak a hypo bath is used, a less soluble salt is formed, $Ag_2S_2O_3, Na_2S_2O_3$, which cannot be removed from the film by soaking in water: and which salt in time decomposes into black or brown silver sulphide. Hence, after-stains on negatives or prints.

Potass. permanganate is the test for hypo in the washing water from prints or negatives. Make: Potass. carbonate, 20 grains; potass. permanganate, 2 grains; water, 40 ounces, and add a drop or two to a few ounces of the wash water to be tested. If hypo is present the pink color is discharged.

Potass. bichromate is sold in bright orange-red crystals, soluble to the extent of 10 per cent. The solution has several very important properties. It undoes the action of light on a gelatino-bromide plate, and fogged plates can be restored by soaking them in the solution; after washing they are much less sensitive than before. Mixed with gelatine, albumen, fish-glue, gum and other colloid bodies, the bichromate forms a coating which is sensitive to light, the gelatine or other body after exposure being insoluble in warm water, attractive of greasy ink and incapable of absorbing water. These differences are the bases of the carbon, gum bichromate, collotype and other processes.

Potass. bichromate is an oxidizing agent, and is a convenient reagent to use for converting the silver image into chloride, bromide or iodide. A 10 grains per ounce solution *plus* 5 drops of hydrochloric acid converts the silver image into chloride. Ten grains of potass. bromide plus 10 minims of nitric acid in place of the hydrochloric acid produces bromide. Ten grains of iodide in place of the bromide produces iodide.

Potass. bichromate solution is an irritant poison internally: taken through the skin it causes watery pustules which are followed by peeling of the skin in these places. Nitrate of mercury ointment is a remedy consisting of: Mercury nitrate, 1 ounce; nitric acid, 1 ½ fluid ounces; lard, 2 ounces; olive oil, 5 drops. Add the acid and mercury to the fats, made fluid by standing the vessel containing them in boiling water. Apart from the above uses, potass. bichromate is used for light filters, as in the Ray Filter, and a 6 per cent solution is advised by Howard Farmer as a safe light for development—a cell containing a ⅜-inch layer or thickness of potass. bichromate in front of a 10 c. p. lamp. Plates should not, however, be exposed direct to such a light.

Silver Nitrate Nitrate of silver is the starting point in the preparation of all silver salts and is most widely used in photography. It

has the formula AgNO_3 and comes in heavy pure white crystals. It is very soluble, dissolving in less than its own weight of water. When quite pure it keeps well, even in the light; but dust and other organic impurities, which cannot be wholly excluded, cause it to darken. Hence it should be kept in the dark, both in crystal form and in solutions. Distilled water should always be used in preparing silver solutions, and it should be kept in glass-stoppered (not corked) bottles. When dissolved in ordinary water, a thick curdy-white precipitate of carbonate and chloride of silver is thrown down. Splashed on the hands or clothes, silver nitrate gives a black stain with a metallic luster, the best remedies for which are potass. cyanide [POISON] and ammonium persulphate. In the same way silver nitrate stains gelatine, and it cannot be applied alone to any dry plate without risk of discoloration. [POISON.]

A useful test for the purity of silver nitrate is as follows: The silver nitrate is dissolved in water and hydrochloric acid added so long as a precipitate is formed. The liquid is then boiled and filtered in a porcelain dish over a water-bath. It should leave no residue whatever. If there is any residue, dissolve out with a little water. To one portion add dilute sulphuric acid; a white precipitate indicates lead. To another add ammonia; a blue color indicates copper. Some samples contain potass. nitrate or other alkaline nitrate. To test, heat a little of the salt in a porcelain crucible until completely decomposed. Dissolve out the residue with water and test with litmus. An alkaline liquid denotes the presence of potash or soda in the salt.

Ammonio-Silver Nitrate This has the formula $\text{AgNO}_3, 2\text{NH}_3$, and is formed in solution when ammonia is added to silver nitrate solution until the precipitate of silver oxide first formed is redissolved. It is used in sensitizing plain paper, the ammonio-nitrate method being an old favorite with workers in this process. See THE PHOTO-MINIATURE No. 21.

Silver Residues A very small part of the silver contained in photographic materials goes to form the image in the negative and print, and those who work with it on a large scale may save considerable by recovering the "lost" silver from the residues or "wastes." This forms a business in itself, but the preliminary processes must be undertaken by the photographer, so I make room for a brief explanation of the matter here.

The waste products which will repay treatment for the recovery of the silver they contain are: (1) Old fixing baths and (2) clippings of albumen, gelatine or collodion paper. Old baths should be let accumulate in a petroleum cask with a wooden spigot an inch or two from the bottom. In the middle of the bottom of the cask a wooden plug is fitted in a round hole. Liver of sulphur (potassium sulphide) is added from time to time, and precipitates the silver as a sludge of silver sulphide; about 1 ounce of "liver" is used for every 4 ounces or so of dissolved hypo. As the liquid is thus deprived of its silver it is tapped off at the side, and

when in course of time the sludge begins to issue from this latter outlet, the plug at the bottom is removed and the sludge collected on a piece of cotton tied over the mouth of a sieve. It is squeezed as dry as possible and sent to the refiners, labeled "Silver Sulphide."

Paper clippings, spoiled paper, etc., are sent as they are to the refiners, or burned to ashes in a place where the draft cannot carry away the ash, which is collected and sent to the refiners.

This salt, with the formula AuCl_3 , Gold Chloride is used in toning prints. It comes in two forms: a yellowish brown crystalline mass (usually in fragments) which absorbs water with avidity; and bright yellow crystals which have the composition AuCl_3HCl . The former is the better for photographic use, as, unlike the yellow chloride, it does not contain an appreciable amount of free hydrochloric acid. Even the brown "C P" chloride, however, contains a little acid, but in composition comes fairly near to $\text{AuCl}_3=65$ per cent of gold. There are other preparations of gold, gold sodium chloride and gold potass. chloride, but these are not commonly offered in the photographic market. They contain less gold, but that matters little, so long as the so-called 15-grain tube of chloride contains the 7 grains of pure gold guaranteed by makers of repute.

Dust, paper, cork, impurities in water and other organic substances decompose gold compounds, throwing the gold out of solution.

Platinum perchloride, also called platinum bichloride, is made by dissolving platinum in *Aqua regia*. It is a brown mass, with the formula $\text{PtCl}_4, 2\text{HCl} \cdot 6\text{H}_2\text{O}$, very soluble in water or alcohol. It can be used for toning, but is not as suitable for this purpose as potass. chloroplatinite.

Potass. chloroplatinite is used for toning collodio and gelatino-chloride prints, together with many varieties of silver papers. It is also employed in the manufacture of platinum papers, although sodium chloroplatinite is preferred as giving more brilliant prints. In toning, the chloroplatinite is used in the form of a solution

made feebly acid with phosphoric acid. The well-known Aristo platinum solution is advised for this latter purpose as a reliable and standard preparation.

Bromide and Iodides *Potassium bromide* dissolves in $1\frac{1}{2}$ times its weight of water and should be neutral. Impure bromide contains potass. carbonate, potass. chloride or potass. bromate. For use in emulsion-making the purest bromide is necessary, whilst for other purposes the quantity used is so small that there is no need to economize. Potassium bromide acts as a restrainer in development, but, unlike ammonium bromide, can be used under all circumstances.

Ammonium bromide absorbs water more readily than the potass. salt and must be kept well stoppered. Any salt which has become damp can be dried by spreading out in a moderately warm place. Ammonium bromide is likewise used in emulsion-making. In developers it acts also as a restrainer, but should not be used in the same solution with caustic soda or potash, as ammonia is liberated. In some cases the combination would be safe, but in others it would produce a fogging developer. Added to some developers (hydroquinone, etc.), in fairly large doses, it gives warm tones on fully exposed lantern plates.

Potass. iodide.—This is very soluble, dissolving in three-fourths its weight of water. The solution alters in the light, as does the salt unless absolutely dry: it becomes yellowish, iodine being liberated. Used in collodion, where only the very purest iodide should be used; in intensification and reduction its usefulness is chiefly due to its solvent powers on mercuric iodide and iodine. See mercuric iodide.

Mercuric Chloride Also known as perchloride, bichloride of mercury, etc. A very heavy, hard salt, requiring hammering or pestelling to reduce it to powder. Not very soluble in cold water, (about 5 per cent), much more so in hot water, which should be used in making a solution. Mixed with an equal weight of ammonium chloride it dissolves much more freely and quickly. Its solution does not keep perfectly in the light, and it is well to add a little hydro-

chloric acid (two or three drops per ounce), which also prevents its powerful hardening action on gelatine. It is a powerful antiseptic and germicide, though it cannot be used in photographic mountants. It is a powerful poison and is readily absorbed by the skin.

Its chief use is in numerous intensification, reduction and toning processes, all dependent on the fact that mercuric chloride converts the silver negative or positive image into a mixture of silver chloride and mercurous chloride. In the platinum process the addition of mercuric chloride to the sensitizing solution or developer gives prints of sepia tone. [POISON.]

Mercurous chloride (calomel) is chiefly notable as being formed when negatives or positives are bleached with mercury. Treated with ammonia it blackens, forming $\text{Hg}_2\text{Cl NH}_2$. Soda sulphite converts it into metallic mercury. Silver potass. cyanide converts it into metallic silver and mercuric cyanide (Monckhoven's intensifier).

Mercuric iodide. In the solid state, a yellow or red substance insoluble in water. It dissolves readily in a solution of potass. iodide, forming the double salt $\text{HgI}_2 \cdot 2\text{KI}$. To prepare the salt as used in intensification, take a saturated solution of mercuric chloride in water and pour of this a sufficient quantity gradually into a solution of $1\frac{1}{4}$ ounces iodide of potassium in 6 ounces water, until the point is reached when the forming red precipitate will no longer dissolve by shaking; but be careful not to add more mercury than just enough to make the solution very slightly turbid. Now add 1 ounce of hyposulphite of soda. Dissolve, and add water to make 20 ounces solution. For use, this should be diluted with about three parts of water. Mercuric iodide also dissolves in soda sulphite solutions; thus Lumiere's intensifier is prepared: mercuric iodide, 45 grains; soda sulphite anhydrous, 440 grains; water, 10 ounces. This is used after fixation and washing; the negative being redeveloped to complete the operation. [POISON.] See mercuric chloride in table at end.

Copper Sulphate This comes in large blue crystals, with the formula $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. Copper sulphate is added to the wet collodion developer to give greater contrast. Other copper salts



From a "gum" print by
Katharine S. Stanbery



A FARMYARD
James H. McCorkle

(chloride, bromide, ferricyanide, etc.) are formed from it by adding the corresponding salt of potash or soda.

Copper Chloride A very soluble cupric salt. In the dry state it forms light green crystals of $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$, but is best formed in solution by dissolving copper sulphate (250 parts) and common salt (120 parts), each in as little hot water as possible, mixing and cooling. Crystals of soda sulphate separate out, and the clear solution of copper chloride is poured off into another bottle; 100 parts $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ give 68 $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$, from which the strength of the solution can be adjusted as desired. Converts the silver image into silver chloride and thus acts in toning and reducing negatives or prints. Spiller's single-solution reducer is salt 3 parts, copper sulphate 1 part, water 13 parts, but the excess of salt does not properly remove the silver chloride as fast as it is formed, after the manner of a proper reducer, so that a hypo bath must follow.

Copper bromide—also very soluble and made by mixing copper sulphate (200 grains dissolved in 1 ounce of hot water) with potass. bromide (200 grains dissolved in 1 ounce of hot water). The green solution is poured from the soda sulphate as before. One hundred parts of copper sulphate give about 90 of the bromide. Used as an intensifier. The negative is bleached in the above solution, washed for a short time only, and blackened in a 10 per cent silver nitrate solution. Short washing is important; otherwise no intensification results. This is due to the cuprous bromide becoming oxidized to cupric bromide, which is unable to attract silver to itself from the silver nitrate. Also, with some tap waters, the cuprous bromide is converted into carbonate and becomes similarly inactive.

Copper Ferricyanide This is not soluble in water, but falls as brownish precipitant when solutions of potass. ferricyanide and copper sulphate are mixed. It dissolves in ammonia or in potass. citrate solution. The latter is best, and a solution of copper ferricyanide therein forms the bromide paper toning solution of Ferguson. Ten per cent solutions of the three salts are mixed in the following order and propor-

tion: Potass. citrate, 50 vols.; copper sulphate, 7 vols.; potass ferricyanide, 6 vols. In this mixed solution the prints are kept moving until they reach the desired tone, and then well washed. The copper ferricyanide in this mixture is converted by the silver of the print into copper ferricyanide, which is red in color. This is the main reaction, but there are other more complicated changes.

There are two series of iron salts, ferrous or proto-salts and ferric or per-salts. They differ in the proportion of oxygen or other negative element, such as chlorine, which they contain. For example, ferrous chloride is FeCl_2 and ferric chloride Fe_2Cl_6 . Ferric salts readily pass or reduce to ferrous salts, and, vice versa, ferrous salts "oxidize" into ferric salts. Thus a solution of proto-sulphate of iron, exposed to the air, takes up oxygen, and becomes yellow instead of pure green: it has been partially converted into ferric sulphate. Ferric chloride, on the other hand, applied as a solution to paper which is then dried, bleaches on exposure to light, becoming converted into ferrous salt. These two changes are typical of the uses of the two sets of compounds. Ferrous salts abstract oxygen from bodies, thereby becoming themselves oxidized, and are, therefore, useful reducing agents in developing, etc. Ferric salts are oxidizing agents and become reduced in the light; they form the basis of a number of printing processes.

Ferrous sulphate, or proto-sulphate of iron (green vitriol), is $\text{FeSO}_4, 7\text{H}_2\text{O}$. It should be in clear pale green crystals free from brown or reddish marks. These latter denote oxidation, which goes on if the crystals are kept exposed to air and damp. If only slight, a little sulphuric acid added when dissolving the iron for ferrous oxalate developer will put matters right, a fragment or two of clean piano wire being also added; in an acid solution it produces hydrogen, which at once re-converts any ferric salt into the ferrous condition. An acid should always be added when dissolving the salt for development. Citric acid (30 grains per ounce of ferrous sulphate) or sulphuric (3 or 4 drops per ounce) are used for this purpose.

Ferrous sulphate is the chief ingredient in certain stain-removing baths, e. g. :—Ferrous sulphate, 1 ounce ; alum, 1 ounce ; citric acid, 1 ounce ; water, 20 ounces. It is the raw material from which all other fine salts of iron, such as oxalate citrate, are made.

Ferrous Oxalate This is the active substance of the developer of that name, and comes as a lemon-yellow crystalline powder, insoluble in water, but soluble in strong solution of potass. oxalate. Hence it is always prepared by adding ferrous sulphate solution to potass. oxalate solution, not vice versa, as then there is a danger of ferrous oxalate being precipitated, and it is a general rule in chemistry that to keep a chemical in solution is an easier matter than to get it there, however soluble it may be in certain liquids.

In course of use, ferrous oxalate passes into ferric oxalate, which forms with the potass. oxalate a double oxalate. This salt, in bright green crystals, is often seen in dishes long used for oxalate development. By exposing old ferrous oxalate developer to sunlight, *plus* a little tartaric acid, its activity can be restored.

Ferric Chloride The ferric chloride specified in formulæ has the formula $\text{Fe}_2\text{Cl}_6, 12\text{H}_2\text{O}$ and is equal to about 60 per cent of anhydrous, or sublimed chloride. It comes in three forms (1), anhydrous ; (2), crystallized or "lump," and (3), in solution. The sublimed salt is pure, in small dark green crystals, which absorb water very greedily. The crystal salt is also extremely deliquescent.

Solutions of ferric chloride are used in preparing sensitizing solutions for "blue" and "blackline" papers. The proportion of anhydrous chloride contained in commercial solutions is indicated by their specific gravity. Thus a solution of 45 degrees Baume = 1.45 sp. gr. contains about 68 per cent anhydrous chloride.

It is used as a reducer for negatives (in the form of a 2 per cent solution) and as already mentioned.

Ferric Ammonium Citrate This salt occurs in two forms, brown and green. Both compounds are somewhat sensitive to light and should be stored in a dark place ; also well stoppered, as they ab-

sorb water. The brown citrate is sold at every drug-store in reddish brown scales and is the standard iron salt for preparing blue-print paper. Unless green is specially mentioned, the brown salt should be used. Standard formula: (1) Ferric am. citrate, 80 grains; water, 1 ounce. (2) Potass. ferricyanide, 60 grains; water, 1 ounce. Mix, keep in the dark and filter before using. Apply to paper with sponge, dry quickly and print until image is visible in dark blue. Then wash well and dry.

Green ferric ammonium citrate, first suggested by Valenta, gives a paper about six times more sensitive than that made with the brown salt. It is made by Merck, of Darmstadt, and is obtainable only from large chemical houses. Formula: (1) Green citrate, 110 grains; water, 1 ounce. (2) Potass. ferricyanide, 40 grains; water, 1 ounce. Mix, and use as above. Notice the much lower proportion of ferricyanide; if almost equal weight, as given for the brown citrate, be used, the prints will be foggy.

Both citrates are used in making solutions for home-sensitizing paper, post-cards, etc. A good formula is: Silver nitrate, 55 grains in 4 to 6 drams of distilled water; ammonia added to clear precipitate first formed; 45 grains green ferric ammonium citrate now added in 1 ounce of water. This solution should be kept in the dark and applied with a brush.

$K_4Fe(CN)_6 \cdot 3H_2O$ is known also as Potass. yellow prussiate of potash. It is purchased in large lemon-yellow crystals, which in some samples are transparent, in others turbid or translucent. This turbidity, however, is no sign of impurity. The salt keeps well whether bottled or not, is neutral and is not itself poisonous. But its solutions in contact with an acid slowly give off fumes of prussic acid; for this reason the bath of ferrocyanide used for developing Pellet prints should be in a well-ventilated plate.

Its chief use is in the Pellet process (See THE PHOTO-MINIATURE No. 10), in which copies in blue lines upon a white ground are made from a positive tracing. It acts here by forming a deep-colored pre-

precipitate of Prussian blue, with the unaltered ferric salt under the lines of the tracing, but a bluish white precipitate with the ferrous salt which forms the ground of the paper. This latter precipitate is removed by the acid bath which follows, leaving the lines of the drawing in intense Prussian blue.

It has also been recommended in the hydroquinone developer as giving clear, brilliant negatives: (A) Hydroquinone, 10 grains; potass. ferrocyanide, 120 grains; soda sulphite, 40 grains; water, $2\frac{1}{4}$ ounces. (B) Caustic potash, 1 ounce; water, 2 ounces. For use mix 10 parts of A with 1 part of B.

Potass. Ferricyanide $K_6Fe_2(CN)_{12}$, or red prussiate of potash, should be in clear ruby-red crystals, free from a dirty opaque appearance on the surface. Crystals which are not transparent should be rinsed with a little water and dried between blotting paper before weighing out. Both in the solid state and in solution it alters in the light, forming ferrocyanide and a blue precipitate. Hence storage in the dark is necessary. Its solubility is 40 parts of salt in 100 parts of water. The strong solution is brownish yellow; the weak, lemon-yellow.

Its chief use is in various reducing and intensifying processes, where it acts by reason of its oxidizing action on the silver image, converting the metal into a mixture of silver and potass. ferrocyanide. The latter is washed away; the former is left in the film and is dissolved out by hypo, as in Farmer's reducer; or it is converted into uranium ferrocyanide, as in the uranium toning or intensifying process; or into copper ferrocyanide by copper sulphate, as in Ferguson's process of copper toning; or into lead ferrocyanide by lead acetate in the lead intensifier. All these processes depend on the first action of ferricyanide on the silver, and in most cases the ferricyanide is mixed with the other salt necessary to the process, so that the two changes take place at once.

In the ferro-prussiate process, ferricyanide forms a deep blue insoluble precipitate (Turnbull's blue) with ferrous salts, but only a brown coloration with ferric salts.

Lead Acetate $\text{Pb}(\text{H}_3\text{C}_2\text{O}_2)_2 \cdot 3\text{H}_2\text{O}$. Dissolves in $1\frac{1}{2}$ times its weight of cold water, but forms a milky solution with ordinary tap water. Chiefly used in combined toning baths, where it forms double hyposulphite of lead. According to Lumière Bros., this compound acts as a carrier of the gold from the gold chloride to the print. If lead nitrate or acetate is employed in a neutral solution and the prints are washed before immersing therein the fugitive results complained of in combined baths do not appear. A proper bath is: Lead nitrate, 1 part; hypo, 20 parts; water, 100 parts. One per cent gold chloride solution, 50 parts. [POISON.]

Lead Nitrate $\text{Pb}(\text{NO}_3)_2$. Dissolves in 8 times its weight of water. Used in the combined bath like lead acetate. Also in the lead intensifier: Lead nitrate, 20 grains; potass. ferricyanide, 30 grains; water, 1 ounce. Bleach in this, wash very thoroughly and blacken with ammonium sulphide. [POISON.] See lead acetate in table at end.

Uranium Nitrate Greenish yellow crystals of the formula $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$; very soluble in water, alcohol and ether.

Uranium Acetate Greenish yellow and very soluble crystals. Both these uranium salts alter in the light and absorb moisture readily.

Hence store, well stoppered, in the dark.

Both are sensitive to light when mixed with organic matter, becoming reduced to uranous salts. Thus, paper floated for 5 minutes on uranium nitrate 88 grains, water 1 ounce, and dried quickly, prints to a visible image and is developed to a Bartolozzi red print on potass. ferricyanide solution (60 grains per ounce) after first washing in water.

In admixture with iron salts, uranium gives an extremely rapid blue paper. A formula is—green ferric ammonium citrate, 110 grains; uranic nitrate, 35 grains; water, 1 ounce. This extra rapidity is probably due first to the reduction of uranic salt, by which the uranous salt formed reducing the ferric salt near it to ferrous salt, becoming itself thereby re-oxidized to uranic and ready for reduction again by the light.

Uranium ferricyanide is a soluble body; uranium ferrocyanide a red insoluble compound. Hence the use of uranium in toning and intensification, which will be clear on reading the section on potass. ferricyanide.

Alums are compounds of aluminum sulphate with the sulphates of potass. soda or ammonia. The formula of potash alum is, $\text{Al}_2(\text{SO}_4)_3, \text{K}_2\text{SO}_4, 24\text{H}_2\text{O}$. Soda alum would have the K_2 replaced by Na_2 , and ammonia alum by $(\text{NH}_4)_2$. For photographic use the three varieties are practically alike. Each dissolves in cold water to make a 12 per cent solution, but is enormously more soluble in hot water.

Alum hardens gelatine and is used alone for this purpose in 5 or 10 per cent solution for negatives; or alum is added to the fixing bath. Formula: alum (sat. sol.), 1 part; soda sulphite (sat. sol.), 2 to 3 parts; hypo (sat. sol.), $1\frac{1}{4}$ parts. Mix; let stand and filter.

Alum in weaker solution *plus* acid removes stains from negatives and bromide prints. Alum, 1 ounce; hydrochloric acid, $\frac{1}{4}$ ounce; water, 20 ounces.

Chrome alum is similar to ordinary alum in chemical composition, but contains chromium in place of aluminum. It will make a 16 per cent solution, the violet crystals dissolving to a ruby-red liquid. This hardens gelatine rather more strongly than ordinary alum, but a weaker solution will answer the same purpose. In clearing properties chrome alum is likewise superior to ordinary alum. Formula: Chrome alum, 1 ounce; citric acid, $\frac{1}{2}$ ounce; water, 20 ounces. This mixture destroys the last traces of hypo left in a negative after washing.

Gelatine hardened with chrome alum is used as a coating for glass to which another gelatine or a collodion film is to adhere. For this purpose 1 part of gelatine is dissolved in 300 parts of hot water, and 5 parts of a 2 per cent chrome alum solution are added to the warm filtered solution which is flowed over the glass, whilst still warm. It has many other uses.

Potass. cyanide is sold in white opaque lumps, which become damp in the air and give off a sickly vapor containing prussic acid. Both the salt and this vapor are intensely

poisonous. Extremely soluble in cold water: decomposed by hot. Commercial potass. cyanide is rarely pure KCN; it generally contains potass. cyanate and carbonate, which do not, however, affect its use in the few instances where it is desirable to use it in dry plate photography.

It dissolves silver bromide, chloride and iodide and is still used as a fixer in the wet plate process. It dissolves the silver image also to some extent, which fact is one reason for the "brilliant" character of wet plate negatives. Now used chiefly in the iodine-cyanide reducer, where it gives rise to iodine cyanide, CNI, which acts on the silver image forming silver iodide, which again is at once dissolved by the excess of cyanide. Formula: 4 per cent potass. cyanide solution to which a few drops of 1 per cent iodine solution in spirit are added. [POISON.]

Ammonium sulphocyanide—or thiocyanate (not sulphocyanate, as often written) is sold as white moist crystals in stock solution, say 1 ounce in water to make a total bulk of 9 ounces, when every 10 minims=1 grain. Pure sulphocyanide of ammonium should not give any color on addition of a little hydrochloric acid to its solution in water; with silver nitrate it should give a white precipitate completely soluble in ammonia.

Ammonium sulphocyanide acts as a weak fixing agent on silver chloride; it also softens gelatine. For these two reasons its proportion in toning baths for gelatine prints must be kept down. The first named property would mean the fixation and weakening of the print before it was properly toned.

Gold sulphocyanides.—These are very important compounds from the point of view of toning gelatine and collodion prints. When a little sulphocyanide is added to gold chloride solution in the cold, a deep red precipitate results. This is auric sulphocyanide, $\text{Au}(\text{CNS})_3$; it dissolves when more sulphocyanide is added to a colorless solution which contains $\text{Au}(\text{CNS})_3$, AmCNS —a double salt. But if gold chloride solution be added, little by little, to a nearly boiling solution of ammonium sulphocyanide, a colorless solution of aurous sulphocyanide, AuCNS , in excess of sulphocyanide is formed.

This preparation tones much better than sulphocyanide baths made in the cold and keeps if stored in the dark in stoppered bottles. One of the best formulæ is (1) Hot water, $1\frac{1}{2}$ ounces; gold chloride, 15 grains; strontium chloride, 150 grains; heat nearly to boiling. (2) Hot water, $1\frac{1}{2}$ ounces; potass. sulphocyanide, 40 grains. Add No. 2 to No. 1 in 2-dram doses and make up 30 drams. Dilute $\frac{1}{2}$ dram to 2 or 4 ounces for toning baths.

Whether prepared in the heat or cold, the gold should always be added to the sulphocyanide, never vice versa; and it is well to add in small doses each of about $\frac{1}{10}$ the whole quantity, the object being to avoid the formation of the insoluble single sulphocyanide.

The various substances used in the
Mountants preparation of mountants are well worth consideration, because of their probable influence on the prints mounted with them.

Starch should be a pure white powder, insoluble in cold water, perfectly neutral and without taste or smell. The prepared starch sold for laundry purposes is not so suitable as the chemically pure substance. Starch consists of granules, which differ in size and shape according to the source of the starch. When the starch is treated with warm water, the granules swell and at last burst, forming a jelly-like mixture—starch paste. Some starches jellyify at lower temperatures than others. Lintner gives the following figures for the jellyifying point for starch from various cereals: Potato, 150° F.; maize, 168° ; barley, 176° ; wheat, 176° ; rice, 176° ; rye, 176° .

Treated with an alkali, starch swells up and forms a very sticky mixture, which makes a first-rate paste for odd work, as it is made in a minute or two without heat, but it is quite unsuitable for a photographic mountant. Formula: Mix starch into a thin cream with water and add caustic potash solution until the starch gelatinizes. The sticky mixture can be worked down with water as desired.

Starch mountant is best made fresh from starch and water, nothing else—but if wanted to keep, the following is a good formula: Grind 1 ounce of starch with a

little cold water, and dilute to 10 ounces or so. Boil until the mixture jellifies and for a few minutes longer. Then, while quite hot, add glycerine $\frac{1}{2}$ ounce, oil of cloves a few drops, and place aside to cool. When nearly cold stir slowly in methylated spirit or wood alcohol $\frac{1}{2}$ ounce, and mix thoroughly.

Dextrine (or British gum) is made from starch, and hence is called also "starch gum." As sold, it may be white or dark brown in color, or anything between. For mounting purposes it should be pale and free from acid. As acid is used in its manufacture, it sometimes is found in commercial dextrines. Dextrine is better than starch in not penetrating into the paper of the print; so that it does not dull the gloss of stripped prints or produce so much curling of the mounts to which the prints are fixed.

Gum arabic for mounting must be white and pure. Much gum is the opposite of this, and there are other imitations consisting of "rock sugar, milk and water-glass." Formula for gum mountant: A thick solution, about two parts of water and one of gum.

Gelatine is the adhesive constituent of glue, which may be considered a more or less impure gelatine. Gelatine keeps well when dry, but when damp becomes first acid and then alkaline, giving off ammonia and losing its property of "sticking." Placed in cold water, gelatine takes up five to ten times its weight of water, and dissolves in what it has absorbed, on the temperature being raised. On cooling, the solution (even if only 1 per cent) sets to a jelly. Much heating, however, destroys this property of setting. Chloral hydrate forms a solution of gelatine in the cold, the mixture making a very adhesive fluid mountant: Gelatine, 2 parts, is swollen in water 6 parts, dissolved on the water bath, chloral 1 part added, and the whole heated for a short time, a few drops of alkali solution being added to make it neutral.

The chief use of gelatine is in emulsion-making: a warm solution of it is a medium in which silver bromide, freshly precipitated, does not clot together as in water, but remains in an extremely fine state of division. Also used as a mountant, alone or in combination with starch.

Fish-glue, unlike ordinary glue, does not jellyfy. It dissolves in cold water and the solution forms a very powerful adhesive. Fish-glue, as now used by process workers, is neutral and quite suitable for mounting photographic prints.

When a liquid preparation, say, a blue-print sensitizing solution, is applied to certain paper, the liquid is taken up in the pores of the paper instead of remaining on the surface. Such paper is "unsized." Sizing consists in filling up its pores with some inert substance, which can be applied in solution or in a fluid paste, so that it penetrates the paper and, on drying, is left as a solid, filling up the pores. Chemicals used for this purpose are "sizes," and most of the "mountant" substances just mentioned act as size. Arrowroot, gelatine and gum are favorite sizes. A good arrowroot formula is: Arrowroot, 90 grains; glucose, 20 grains; water, 10 ounces. Mix first in a little cold water, add the remainder hot and boil for a minute or two.

Coatings for the backs of plates should have, as nearly as possible, the same refractive index as glass. Caramel and asphaltum come nearest in this respect, and are the two best preventives of halation.

**Backing
Chemicals**

Caramel of commerce is a sticky substance consisting of several bodies, one of which, caramelene, is the chemical required for backing plates. It is prepared as follows (Haddon): Place one pound of loaf sugar in a large stew-pan and heat on a clear fire or gas stove. As soon as melting begins, stir with an iron spoon to prevent burning of the sugar. As soon as the sugar is all melted, bubbles will begin, and the temperature will commence. In a minute or two bubbling ceases, and the mass is now heated to 220°C (450°Fahr.). It should be a thin fluid of light red color. Keep it at 220°C for fifteen minutes, testing with thermometer and adjusting the gas. At the end of this time it begins to thicken, and it should not be cooked for more than four or five minutes after this. Pour out onto a metal plate or slab of slate, and if all has been well the mass will set brittle and free from tackiness.

Break into small pieces, place in a bottle, add water equal to about one-third the height of the caramel and set aside for a day or two. A thick, treacly mass results. Ordinary wood alcohol is now added in bulk equal to eight or ten times the volume of the syrup. The addition of spirit in this proportion forms a mixture which dissolves out the tacky and moist constituent of the caramel and precipitates the carameline as a dark-colored mass at the bottom of the liquid. Pour off the liquid and mix the carameline with enough water to form a fairly fluid mixture. This alone applied to plates gives a coating which is apt to flake off: by adding $\frac{1}{8}$ to $\frac{1}{10}$ of the original caramel solution a mixture is obtained which dries hard and yet remains firmly attached to the glass.

A little of the solution is therefore set aside for this purpose before adding the alcohol. A quicker-drying backing is obtained by using a mixture of methylated spirit (1 part) and water (3 parts), when dissolving the lump of carameline. Caramel backing requires no addition such as sienna, except when used on panchromatic plates, and then the finest India ink is the proper pigment.

Asphaltum or bitumen of Judæa is a resin-like body containing sulphur, much used in photo-engraving. It is insoluble in water, but dissolves readily in benzene, alcohol, chloroform and turpentine. Benzene and chloroform are the most suitable liquids for a backing solution, the asphalt being dissolved in such proportion that the solution gives a dark brown film when spread on a glass plate; a little india-rubber solution added prevents the asphalt flaking off.

Many organic compounds "go bad"

Antiseptics or decompose when exposed to the air, or even when stoppered. This is due to the presence of a living organism or microbe which feeds upon the chemical and converts it into different compounds. Bodies which prevent or arrest this change are antiseptic. For photographic purposes the most useful are:

Thymol, or thyme camphor, is sold in white crystals with an odor of thyme and a pungent taste. It dissolves only slightly in water but freely in spirit. In

adding it to preparations such as mountants, it is dissolved in spirit and the solution should be poured slowly into the mixture. Some scent is often added to mask the thyme odor.

Carbolic acid, pure, is a crystalline solid, soluble in any proportion in alcohol. With water its behavior is peculiar. Add water little by little to the crystals and you soon obtain a mixture which is perfectly clear and fluid; further addition of water precipitates the carbolic acid, which does not again entirely dissolve until a good deal of water has been added.

Alcohol (methylated spirit, wood alcohol or absolute alcohol) is an antiseptic. Alum, boric acid, oil of cloves and salicylic acid are all feebler antiseptics; the last is useful in preventing the mold which grows in solutions of citrates and phosphates.

Bichloride of mercury is a most powerful antiseptic and germicide, but it must never be used in any preparation such as mountant or size, which is to come in contact with a silver print, as it rapidly bleaches the silver image and will discolor a platinum print.

Certain coloring matters are extremely valuable in photography for (1) rendering plates sensitive to the green, yellow and red rays of the spectrum; (2) the preparation of light filters used for taking negatives in orthochromatic and tri-color photography and in filtering the light of the dark-room. The chief dyes are as follows:

Eosin, or the potassium or sodium salt of tetra-brom-fluorescin. It forms red crystals, soluble in water. It sensitizes gelatino-bromide plates to the green and yellow of the spectrum. One one-thousandth per cent, or 1 part in 100,000, is the proportion added to the emulsion, or the plates are bathed. See THE PHOTO-MINIATURE No. 6: *Orthochromatic Photography*.

Erythrosin (tetraiodo fluorescein) is a red powder easily soluble in water, sparingly soluble in alcohol. Sensitizes for yellow and green. Erythroside of silver is a compound, formed from erythrosin and silver nitrate, which is added to gelatino-bromide emulsion.

Cyanine, or quinoline blue, sensitizes for the red. It is very slightly soluble in hot water, very soluble in

alcohol. Cyanine and chinoline red is the mixture used by Vogel for preparing Iso. plates under the name Azaline.

Aurantia is an orange-colored dye, recommended for yellow light filters. It dissolves readily in alcohol, sparingly in water.

Aurine is red glittering crystals, but the dye solutions are yellow. Easily soluble in alcohol, sparingly in water. Used for light filters and for backing plates.

Picric acid, or tri-nitro-phenol, was formerly advised for a yellow screen, but the screen becomes deeper on exposure to light and has not the transparency of other dyes, such as tartrazin, which practically do not "damp" or "dim" the spectrum at all, i. e., do not cut off rays of all colors.

Hypo Eliminators Certain salts (oxidizing agents) convert hypo, whether simply dissolved in water or existing in the gelatine film or glass or paper, into other compounds. They are used as eliminators, but I do not favor this employment, because it is often doubtful whether the compounds they produce are less harmful than hypo pure and simple. Among the salts are periodate, perborate, persulphate and percarbonate. The last two are the best of these, potassium percarbonate and persulphate being on the market under fancy names.

Magnesium and Aluminium These are of importance through their use in flash powders. Magnesium is a silver-white metal, slowly acquiring a white crust of oxide in damp air. When it burns this oxide is formed and is faintly alkaline.

Aluminium is likewise silver-white and oxidizes only with extreme slowness in air. For flashlight purposes aluminium must be free from grease, and, as the commercial "aluminium bronze" generally contains this, it is first treated with benzene, and dried.

Of the various products used to burn up aluminium and magnesium the best are potass. permanganate, potass. perchlorate, potass. nitrate; potass. chlorate is not a good "combustant." Potass. chlorate and antimony sulphide in the same mixture form a very explosive combination, which can only be made by grinding

each constituent separately and mixing on paper with a feather—a dangerous operation at best.

Potass. perchlorate, NClO_4 , is one of the oxidizers of magnesium for flashlight purposes. It dissolves only slightly in water, does not absorb moisture readily, and, as it decomposes at a higher temperature than potassium chlorate, it gives a more intense light.

Potassium nitrate is used with an equal quantity of magnesium powder. Scrupulous care should be used in handling or mixing flashlight compounds, as they are all explosive under varying conditions. It is better to buy them ready for use, and this, in itself, offers risk enough in storage and combustion.

Certain chemicals discharge the color

Decolorizers from various colored compounds and are rightly called decolorizers. The photographer whose concern is to remove stains and other coloring compounds from his gelatine films will be inclined to extend the title to others which do not bleach but dissolve away the stain on a plate or print. Bleaching powder, persulphate and others are among the first; soda sulphite, soda carbonate and caustic soda are among the second.

Bleaching powder is a moist powder with a faint smell due to chlorine gas. A bleaching solution is made from it as follows: Shake up 1 part of bleaching powder with $1\frac{1}{4}$ parts of crystallized sodium carbonate, previously dissolved in water. Shake well and after a little time filter. Shake up again with a little water. Repeat a third time, and you will now have a fairly concentrated solution of sodium hypochlorite. It should be alkaline; if made acid, it removes stain still more energetically—and the silver image also.

A 5 or 10 per cent of soda carbonate slowly dissolves certain stains, such as those in pyro-soda-developed negatives. Soda sulphite added to developing solutions is the most important of decolorizers or anti-stains.

Chemically, these are the products of
Resins oxidizing ethereal oils. The most important are shellac, gum dammar, gum elemi, mastic, sandarac and amber. Their uses are in varnish-making. They are all insoluble in water, but

dissolve in one or other of the solvents, alcohol, chloroform, ether, or amyl acetate.

Shellac is bought in yellow or brown scales. White or bleached shellac gives a paler varnish, but as it is apt to retain traces of the bleaching agent, which would act on the silver image, it should not be used for varnish. Soluble in alcohol, alkalies and borax solutions. To powder shellac in a mortar, wet with water, which prevents the pieces flying out.

Gum dammar, a softer resin than shellac, is suitable for a lantern-slide varnish. The best solvent is benzene; soluble also in turpentine.

Gum elemi: Easily soluble in alcohol, used in varnishes and cerates for prints.

Mastic should be in small clear, pale yellow grains, soluble in alcohol, ether, chloroform and amyl alcohol.

Sandarac: Pale yellow, translucent drops, soluble in alcohol and ether, and in turpentine; less soluble in chloroform and benzene.

Amber: Yellow or brownish pieces; dissolves in the usual solvents on being heated until it forms a yellow-brown mass.

Solvents of Resins	<i>Benzene</i> , volatile and inflammable, does not mix with water but dissolves in four parts of alcohol, a solvent of resins, asphaltum and caoutchouc.
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Chloroform: A colorless heavy liquid; dissolves slightly in water and easily in alcohol *plus* ether; dissolves resins, asphaltum and waxes. [POISON.]

Amylacetate: A colorless oily liquid of fruity odor; dissolves collodion and resins and waxes. Should not be used in varnishes for films.

Alcohol, ethyl alcohol, C_2H_6O , is sold as absolute alcohol, rectified spirit or spirits of wine and wood alcohol or methylated spirit. The first contains 98 to 99 per cent; the second 84 per cent of alcohol. Methylated spirit or wood alcohol is rectified spirit plus 10 per cent crude wood spirit. Since 1891 a small addition of petroleum is made (in England), which causes the spirit to become milky when mixed with water. For varnish-making this spirit is good enough, but for collodion and collodion emulsion, rectified spirit is necessary.

Methylated spirit used to dry negatives soon becomes weak with water; it is strengthened by shaking with dry potass. carbonate (2 ounces of carbonate per pint of spirit), letting stand and pouring off the upper layer, which is the renewed spirit.

Odd Organic Chemicals *Glycerine* is a colorless syrup of sweet taste which mixes with water or spirit in all proportions. Sp. gr. 1.265 at 60° Fahr. It does not dry up in the air, i. e., in the language of the chemist, is not volatile at ordinary temperature; hence it is used in various ways to keep things damp. Thus celluloid films bathed in a weak solution retain a trace in their gelatine coatings and so do not curl when dried. Mountants, such as starch, do not become hard and caked when containing glycerine. The evil of this practice of "glycerining" is that chemical change takes place more readily when substances are slightly damp, and stains on films or spots on prints are often the result of glycerine in the gelatine or in the mountant.

Paper is a chemical, and a very important chemical to the photographer, who has much to fear from impurities in it. Chemically, paper is cellulose, of which cotton wool is a more or less pure form. Paper is made from a number of materials—the finest from good linen rags; cheaper qualities from wood pulp. This raw material is a very undesirable starting point for photographic paper, as paper made from it turns yellow in the light and is frequently acid. Paper for platinum, albumen and other processes, where the sensitive compound is applied without preparation of the surface, must be chemically inert, of fairly close texture (so that the solutions do not soak in) and tough enough to withstand handling when wet. At present this paper is most largely produced in Europe, but excellent paper for photographic use is now being made in America. Inferior papers can be coated with a layer of baryta, which is made to adhere to a "sized" paper by means of alum or formic aldehyde (formalin). Such coated paper can carry slow emulsions and is used in all collodio-chloride, gelatino-chloride and "gaslight" papers of the Velox order, the film of baryta pro-

tecting the sensitive emulsion from any impurities in the paper.

"Sizing" is a filling up of the pores of the paper with an inert body. See sizes on another page.

Two useful tests for a pure raw paper, say for platinum printing, etc., are as follows: (1) Boil fragments with distilled water, filter and add one or two drops of silver nitrate solution to which enough ammonia has been added to redissolve the precipitate just formed. No turbidity should result. (2) Sandwich a strip of the paper between two sensitive dry plates, placed film to film, and store in a good dark slide for eight or ten days. Development should show no dark streak.

Pyroxylin is made from cellulose (paper, cotton, wool and so on) by the action of nitric and sulfuric acid. It resembles in appearance the substance used for making it but is very inflammable, burning in an instant when touched. It is insoluble in water, alcohol or ether, but readily soluble in a mixture of the two latter in equal parts. The solution is collodion. Enamel collodion as used for glazing prints is: Pyroxylin, 10 grains; alcohol, 1 ounce; ether, 1 ounce; castor oil, 5 drops.

Celluloid is a mixture of pyroxylin and camphor. According to Valenta, German celluloid films contain 33 per cent nitro cellulose, 33 per cent camphor and 2 per cent ash; English, nitro-cellulose 74 per cent; camphor, 23 per cent; ash, 3 per cent. Celluloid dissolves in amyl acetate and other solvents and makes a splendid waterproof varnish which, however, dries but slowly: Celluloid, $7\frac{1}{2}$ to 10 parts; amyl acetate, 500 parts. "Zapon" is celluloid varnish similar to the above, made under a patent.

Odd Inorganic Chemicals *Potass. permanganate*: Small purple-red crystals, dissolving (to the extent of 8 per cent) in water to a dark purplish solution. Used as reducer for negatives (Namias): (A) Sulphuric acid, 20 per cent sol; (B) Potass. permanganate, 5 per cent sol. Take A, 40 minims; B, 5 drams; water, 10 ounces; also as a test for hypo, which see.

Schlippe's salt is potass. metantimonate, $\text{Na}_3\text{SbS}_4 \cdot 9\text{H}_2\text{O}$. Very soluble crystals (1 in 3 of water). They should be pure yellow but are usually brownish. Used

to follow mercury in intensification: The solution (10 to 20 grains per ounce of water) should be made fresh or a few minims per ounce of ammonia added to improve its keeping properties. It is also used to restore negatives intensified with Edward's Solution, which become yellow in time.

Ceric sulphate, $\text{Ce}_2(\text{SO}_4)_3$: Yellow crystals which should be dissolved in water containing sulphuric acid, otherwise an insoluble basic salt is formed. Used as a reducer by Lumière: Ceric sulphate, 10 per cent solution, diluted with ten times its volume of water.

Ceric salts on sized paper are reduced by light to cerous salts. This change is the basis of a "negative" printing process by Lumière, the unaltered ceric salt forming brown or green compounds with certain dyes applied to the exposed paper.

Ammonium molybdate: Large yellow crystals soluble in water to which a little nitric acid is added. Used in toning bromide prints: (1) Potass. ferricyanide, 1 part; glacial acetic acid, 100 parts; water, 1,000 parts. (2) Ammonium molybdate, glacial acetic acid and water in same proportions as in No. 1. Use equal parts of Nos. 1 and 2.

Ammonium persulphate, $\text{Am}_2\text{S}_2\text{O}_8$, is purchased in small crystals, which should be dry, as the dry salt keeps well for years, whereas moisture brings about decomposition. This change takes place when the salt is dissolved. Very soluble up to 55 per cent solution. Ammonium persulphate, like other persulphates, is a strong oxidizing agent and thus acts as a destroyer of the last traces of hypo (see hypo-eliminators), but its most characteristic action is that on metals, most of which it attacks and dissolves. Silver is among the number, and hence the use of the salt as a reducer. Its peculiar action is duly set forth in THE PHOTO-MINIATURE No. 15.

Liver of sulphur is potassium sulphide, K_2S_5 , is used in residue recovery and lead intensification.

Calcium chloride is very useful as an absorbent of moisture, in storage of carbon tissues, platinum papers, etc. It should be in dry white lumps, which, when moist, are baked in an iron tray over a fire until bone

dry. Absorbent material for paper storage tubes is made by soaking asbestos in calcium chloride solution and drying first gently and then baking bone dry.

Talc or *French chalk* is really silicate of magnesium. It absorbs traces of grease and is used to perfectly cleanse glass plates in glazing prints by stripping.

Iodine is sold in steely gray flakes, which evaporate slowly in the air and stain the hands deep brown. It dissolves in spirit and in solution of potass. iodide. Used in reducers and as additions to the oxalate developer. [POISON.]

It would lead me too far afield to give
 Testing tests and methods for all the chemicals
 Chemicals here named. Suffice it to say that whenever any of the tests here mentioned are applied, distilled water must be used or the results will be disguised by impurities in the water. Much can often be learned by carrying out simple tests on a sample along with a second of proved purity. Equal weights of the two are weighed out and treated alike throughout.

Tests for Acid and Alkali.—Litmus paper is the generally used test for telling whether a solution is acid or alkaline, the blue paper turning red in acids and the red paper turning blue in alkalies. It is not a safe test when sulphites are present. For this phenolphthalein is best. A drop or so is added to a little of the solution, when, if acid, the whole remains colorless, but if a trace of alkali is present an intense pink color is produced. It is conveniently kept in 1 per cent alcoholic solution and is useless when ammonia, or a salt of ammonia, is present.

I collect here the names of excessively
 Poisons poisonous chemicals, with their symptoms and antidotes. The omission of many others is not to be taken as implying that they are advisable comestibles.

A TABLE OF POISONS AND ANTIDOTES. Compiled by Mr. J. V. Eidsen

POISONS	REMARKS	CHARACTERISTIC SYMPTOMS	ANTIDOTES
OXALIC ACID, including POTASSIUM OXALATE	1 dram is the smallest dose known.	Hot burning sensation in throat and stomach; vomiting, cramps and numbness.	Chalk, whiting, or magnesia suspended in water. Plaster or mortar can be used in emergency. Vinegar and water.
AMMONIA POTASH SODA	Vapor of ammonia may cause inflammation of the lungs.	Swelling of tongue, mouth and fauces; often followed by stricture of the esophagus.	
MERCURIC CHLORIDE	3 grains the smallest known fatal dose.	Acrid, metallic taste, constriction and burning in throat and stomach, followed by nausea and vomiting.	White and yolk of raw eggs with milk. In emergency, flour paste may be used.
ACETATE OF LEAD	The sub-acetate is still more poisonous.	Constriction in the throat and at pit of stomach; crampy pains and stiffness of abdomen; blue line round the gums.	Sulphates of soda or magnesia. Emetic of sulphate of zinc.
CYANIDE OF POTASSIUM	a. Taken internally. 3 grains fatal.	Insensibility, slow, gasping respiration, dilated pupils, spasmodic closure of the jaws.	No certain remedy; cold effusion over the head and neck most efficacious.
	b. Applied to wounds and abrasions of the skin.	Smarting sensation.	Sulphate of iron should be applied immediately.
BICHROMATE OF POTASSIUM	a. Taken internally.	Irritant pain in stomach and vomiting.	Emetics and magnesia, or chalk.
	b. Applied to slight abrasions of the skin.	Produces troublesome sores and ulcers.	Common salt to be given immediately, followed by emetics.
NITRATE OF SILVER		Powerful irritant.	
NITRIC ACID	2 drams have been fatal. Inhalation of the fumes has also been fatal.	Corrosion of windpipe, and violent inflammation.	Bicarbonate of soda, or carbonate of magnesia or chalk, plaster of the apartment beaten up in water.
HYDROCHLORIC ACID	1/2 ounce has caused death.		
SULPHURIC ACID	1 dram has been fatal.		
HYDROFLUORIC ACID	1/2 ounce has caused death.	Similar to hydrochloric acid, though more violent.	
ACETIC ACID, concentrated, has as powerful an effect as the mineral acids.			
IODINE	Variable in its action; 3 grains have been fatal.	Acrid taste, tightness about the throat, vomiting.	Vomiting should be encouraged, and gruel, arrowroot and starch given freely.
PYROGALLOL	3 grains sufficient to kill a dog.	Resembles phosphorous poisoning.	No certain remedy. Speedy emetic desirable.

The reader is cautioned against giving strong acids or alkalis as antidotes. Where possible give an emollient or emetic and procure medical advice without further delay.

BOOKS

For more fully detailed information concerning the subject matter here discussed, the following text-books are advised :

The Chemistry of Photography. By Raphael Meldola. A series of printed lectures on theoretical chemistry for students. 1891. 371 pp. Cloth, \$2.

The Chemistry of Photography. By W. Jerome Harrison. The most comprehensive and satisfactory work on the subject, but written from the historical rather than the modern practical point of view. 1892. 426 pp. Cloth, \$3.

Chemical Notions for Photographers. (THE PHOTO-MINIATURE Series, No. 18.) A simple and lucid explanation of the chemical changes on which photography is based. With diagrams and other illustrations. 1900. 25 cents.

Chemistry for Photographers. By C. F. Townsend. An excellent first handbook, simple and practical. (English.) Second edition. 1899. Cloth, 50 cents.

Dictionary of Photography. By E. J. Wall. Eighth edition, revised to 1902 by Thomas Bolas. The best book of its class. 656 pp. (English.) Cloth, \$3.75.

First Principles of Photography. By Clement J. Leaper. Containing interesting chapters on the theoretical side of photographic chemistry. 1892. 270 pp. (English.) \$1.25.

Materia Photographica. By Clement J. Leaper. A valuable digest of chemical information, published in 1891; has long been out of print. A second-hand copy is worth from \$1.25 to \$5.

NOTES

The Ives Parallax Stereogram, medaled by the R. P. S., is thus described by Mr. Thomas Bolas in the *Amateur Photographer*: "This adds one to the list of stereoscopic curiosities by which a stereoscopic effect can be realized without the use of any special instrument by the beholder, and in this respect it ranks near to the Clerk-Maxwell system of real-image stereoscopy as used by him in the class-teaching of solid geometry. In the same class we have the crystal cube of Mr. Henry Swan, and the Claudet stereo-monoscope, which was exhibited at the Polytechnic Institute some forty years ago. The introduction of Mr. Ives' parallax stereogram may possibly revive the popularity of open-vision stereoscopic effects. In appearance, Mr. Ives' stereogram somewhat resembles an ordinary transparency backed by ground glass, the positive transparency consisting of narrow vertical stripes or bands about one-seventieth of an inch wide, and derived alternately from the two halves of a stereogram. If such a composite positive is viewed in the ordinary way both aspects of the original subject are seen as superimposed, and a confused or double image is the result. In order to so arrange matters that each eye sees its appropriate image, a suitable screen of opaque lines on glass is bound up with the composite positive, and about a twentieth of an inch in front, a position being found at which the opaque lines allow each eye to see its appropriate image, and true stereoscopic effect is thus produced. A slight shift in the angle at which the parallax stereogram is held to the visual axis causes each line of the screen to cover a line of the wrong transparency, and pseudoscopic effect results; still, with very careful adjustment, an intermediate position may be found in which each line of the screen covers half of two consecutive stripes. Under these circumstances, each eye will see both halves of the stereogram and confusion of images will result. The parallax

stereogram is in many ways a specially interesting photographic curiosity."

The forty-seventh annual exhibition of the Royal Photographic Society of Great Britain, held in London, September 29 to November 4, is spoken of as one of the most interesting of the series, despite the fact that it brought forward no work of unusual merit. The exhibition was divided into four sections, embracing: Selected Pictorial Photographs; Scientific, Technical and Photo-Mechanical Exhibits; General Professional Work, and Trade Exhibits. About 1,700 prints were submitted in the Pictorial Section, of which number only 290 found place on the walls. Among the six exhibitors medaled in this section we notice Mr. Frank R. Fraprie, of Fall River, Mass., who secured the much-coveted award for his print titled, "Seven Pines." The only medal given in the Scientific Section was secured by Mr. Frederic E. Ives, of Philadelphia, for his Parallax Stereogram, an ingenious device showing stereoscopic effect in a curious way.

The quality of the work shown in the Pictorial Section was generally regarded as inferior to the average reached at the Salon of the Linked Ring noticed elsewhere. The professional work, however, was of a high order, and the scientific exhibits included several items of interest in radiography, natural history photography, color photography and similar special lines. Taking the exhibition as a whole, there were 246 exhibitors, divided up among the various nations as follows: England, 205; Scotland, 27; Ireland, 1; America, 10; France, 6; Germany, 2; Italy, 1; Africa, 2; New Zealand, 2. This shows America to have been poorly represented. Of the prints exhibited in the Pictorial Section, 93 were carbon prints; 6 Ozo-type, 25 gum-bichromate, 54 bromide, and 4 albumen paper. This leaves 23 prints unclassified.

Tennant and Ward's List OF NEW BOOKS AND PUBLICATIONS

THE LADY POVERTY. A XIIIth Century Allegory, telling how St. Francis of Assisi wooed and won that most difficult of all brides, my Lady Poverty. A delightful volume for all interested in Franciscan and mediæval literature. Written A.D. 1227, now rendered into English for the first time. Translated and edited by MONTGOMERY CARMICHAEL. 209 pp. Cloth. *Net*, \$1.75.

AMERICAN PICTORIAL PHOTOGRAPHY. Representative examples of the work of the American School of Pictorial Photography. Selected by and reproduced in photogravure under the personal supervision of ALFRED STIEGLITZ, and formerly published by "Camera Notes." Series I, *net*, \$10. Series II, *net*, \$6. The edition was limited to 150 copies of each series, and only a few sets are obtainable. Descriptive circular on request.

THE "CAMERA NOTES" IMPROVED GLYCERINE PROCESS for the development of platinum prints, including the experiments of ALFRED STIEGLITZ and JOSEPH T. KEILEY. Illustrated with facsimile reproductions in color, by the experimenters. Reprinted from "Camera Notes." Only a few copies obtainable. Paper covers, *net*, \$1.

AN INDEX OF STANDARD PHOTOGRAMS. Being a guide for Authors, Editors and Publishers of Illustrated Books and Periodicals, Collectors of Pictures, etc., listing photographs available for publication purposes. Sold by subscription only. Particulars on request.

PHOTOGRAPHY FOR NATURALISTS. By DOUGLAS ENGLISH. A book for those interested in photographing animals, etc. 132 pp., fully illustrated. \$2.50.

PRACTICAL NOTES ON TELEPHOTOGRAPHY. By BECK LTD. A pocket-book of practical information. Cloth, 25 cents.

[READY IN JULY.]

THE A B C OF PHOTO-MICROGRAPHY. A practical handbook for beginners, by W. H. WALMSLEY. With plain instructions and many engravings. About 130 pp. Cloth, *net*, \$1.25.

PHOTOGRAPHIC APPARATUS, its making and repairing, by various English writers. Cloth, *net*, \$1.

FINISHING THE NEGATIVE. An encyclopedic treatise on all the processes between development and printing. Edited by GEORGE E. BROWN. 160 pp. Cloth, *net*, \$1.25.

THE LENS. A practical guide to the choice, use and testing of photographic objectives. By GEORGE E. BROWN and THOMAS BOLAS. Profusely illustrated. 130 pp. Cloth, *net*, \$1.25.

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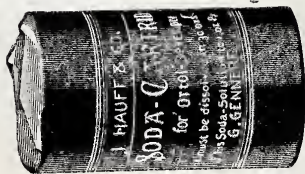
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Discharge of an Eastman Flash Cartridge with pistol. Note the spread of light.

purpose of keeping the powder from sifting about and of spreading the light (as shown in cut) when cartridge is discharged. These cartridges may be discharged with a fuse, with which each one is equipped; or the fuse may be pulled out and thrown away and the fuse hole

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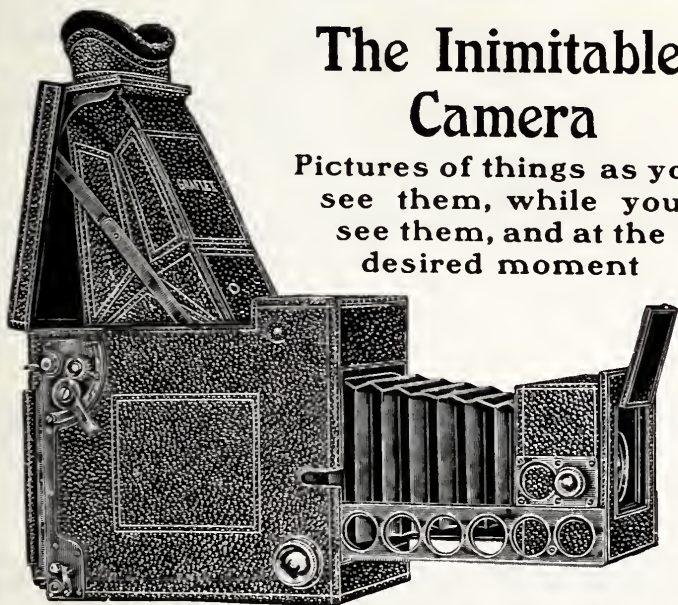
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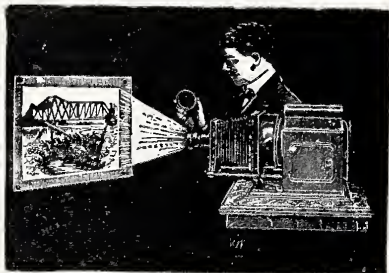
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Water	8 oz.

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Pyrogallie Acid	1 oz.
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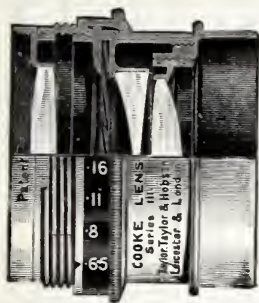


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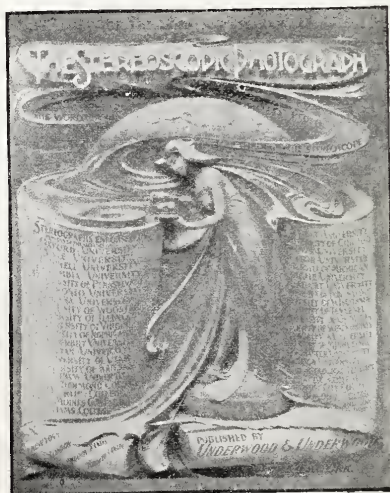
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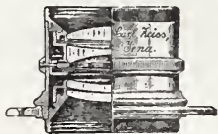
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COLORING PHOTOGRAPHS



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The Photo-Miniature

A Magazine of Photographic Information

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COLORING PHOTOGRAPHS

It would be quite useless, and beside our purpose here, to attempt any defence of the colored photograph as we see it in the picture shops, in the photographer's display windows and in many homes. I will go further, and put myself in agreement with the majority of my readers, by roundly declaring the average colored photograph to be an abomination, richly deserving the contempt with which it is generally regarded. Why, then, make place for a monograph on coloring photographs in THE PHOTO-MINIATURE series? Chiefly because many workers have urged its usefulness, and again, because of an old conviction that in certain circumstances and for obvious purposes, a colored photograph may be an acceptable or desirable thing, serving ends which the uncolored photograph cannot reach. There are colored photographs *and* colored photographs. Those who condemn the practice as an evil without excuse or remedy have looked upon only one side of a subject which has at least two sides. It deserves consideration fairly and without prejudice. I have seen photographs colored in Vienna, in London and in New York, unassailable in the quality of their coloring and altogether pleasing even to the critical eye. As a means of livelihood, moreover, the skilful coloring of photographic prints offers opportunities not to be despised. More especially for women of cultivated tastes, who will make themselves expert in the work, there is a field of employment big with remunerative possibilities. As far as the amateur is concerned, the coloring of some of his or her photographs offers pleasant occupation for the quiet days, and may reasonably

add to the attractiveness of the prints. If, then, we find that the colored photograph can be invested with either commercial or esthetic interest, surely it will be worth while knowing how to do the work for oneself, without depending upon an outsider in such a matter, where individual taste must so largely contribute to our satisfaction in the result.

**The Charm
of Color**

First, there is the irresistible charm of color, universal, existing in all times and among all sorts and conditions of men since the beginning of the world. I know of no writer who has described this charm so happily as the late Mr. Rood, in his "Modern Chromatics." He says: "The power to perceive color is one of the most indispensable endowments of our race; deprived of its possession, we should be able not only to exist, but even to attain a high state of intellectual and esthetic cultivation. Eyes gifted merely with a sense for light and shade would answer quite well for most practical purposes, and they would still reveal to us in the material universe an amount of beauty far transcending our capacity for reception. But over and above this we have received yet one more gift, something not quite necessary, a benediction as it were, in our sense for and enjoyment of color. It is hardly fair to say that without this gift nature would have appeared to us cold and bare; still we should have lost the enjoyment of the vast variety of pleasant and refined sensations produced by color as such and by color combinations; the magical drapery which is thus cast over the visible world would have given place merely to the simpler and more logical gradations of light and shade.

"The love of color is part of our constitution as much as our love for music; it develops itself early in childhood and we see it exhibited by savage as well as cultivated races. We find the love of color manifesting and making itself felt in the strangest places; even the profound mathematicians are never weary of studying the colors of polarized light, and there can be no doubt that the attractive power of color has contributed to swell the mathematical literature of this subject. The solar spectrum was for many years before the discov-

eries of Kirchoff and Bunsen a favorite, almost a beloved subject of study with physicists; the great reward of this devotion was withheld for nearly half a century; divested of its color charm, attracting less study, the spectrum might have remained an enigma for another hundred years.

"Color is less important than form, but casts over it a peculiar charm. If form is wrongly seen or falsely represented, we feel as if 'the foundations are shaken;' if the color is bad, we are simply disgusted. Color does not assist in developing form; it ornaments and at the same time slightly disguises it. We are content to miss some of the modeling of a beautiful face for the sake of the color-gradations which adorn and enliven it.

About Color-Gradations "One of the most important characteristics of color in nature is the endless, almost infinite gradations which always accompany it. It is impossible to escape from the delicate changes which the color of all natural objects undergoes, owing to the way the light strikes them, without taking all the precautions necessary for an experiment in a physical laboratory. Even if the surface employed be flat and white, still some portions of it are sure to be more highly illuminated than others, and hence to appear a little more yellowish or less grayish; and, beside this source of change, it is receiving colored light from all colored objects near it, and reflecting it variously from its different portions. If a painter represents a sheet of paper in a picture by a uniform white or gray patch, it will seem quite wrong, and cannot be made to look right till it is covered by delicate gradations of light and shade and color. We are in the habit of thinking of a sheet of paper as being quite uniform in tint, and yet instantly reject as insufficient such a representation of it. In this matter our unconscious education is enormously in advance of our conscious; our memory of sensations is immense, our recollection of the causes that produce them utterly insignificant; and we do not remember the causes mainly because we never knew them.

"These ever-present gentle changes of color in all natural objects give to the mind a sense of the richness

and vastness of the resources of nature ; there is always something more to see, some new evanescent series of delicate tints to trace ; and even where there is no conscious study of color, it still produces its effect on the mind of the beholder, giving him a sense of the fullness of nature and a dim perception of the infinite series of delicate changes by which she constantly varies the aspects of the commonest objects. This orderly succession of tints gently blending into one another is one of the greatest sources of beauty that we are acquainted with, and the best artists constantly strive to introduce more and more of this element into their works, relying for their triumphs far more on gradations of tint than on contrasts."

A Word from Ruskin Speaking of gradations of colors, Ruskin says : " You will find in practice that brilliancy of hue and vigor of light, and even the aspect of transparency in shade, are essentially dependent on this character alone ; hardness, coldness and opacity resulting far more from equality of color than from nature of color." At another time, giving advice to a beginner, he says : " It does not matter how small the touch of color may be, though not larger than the smallest pin's head, if one part of it is not darker than the rest, it is a bad touch ; for it is not merely because the natural fact is so that your colors should be gradated ; the preciousness and pleasantness of color depends more on this than on any other of its qualities, for gradation is to color what curvature is to lines, both being felt to be beautiful by the pure instincts of every human mind, and both, considered as types, expressing the law of gradual change and progress in the human soul itself. What the difference is in mere beauty between a gradated and ungradated color may be seen easily by laying an even tint of rose-color on paper and putting a rose-leaf beside it. The victorious beauty of the rose as compared with other flowers depends wholly on the delicacy and quantity of its color gradations, all other flowers being either less rich in gradations, not having as many folds of leaf, or less tender, being patched and veined instead of flushed."

Where the
Photograph
Fails

All this has a very practical bearing upon the skilful coloring of photographs, and contains valuable suggestions for those who would attempt such work.

The photograph, failing as it does to record the colors of things, or the contrasts of color luminosity in objects as seen by the eye, fails therein to satisfy the common desire. Who, in looking at the photograph of a familiar scene, or of a friend well beloved, or of a flower, has not wished for at least a suggestion of color in the print to complete the illusion of nature? How eagerly do we welcome the suggestion of color, felt rather than seen, in some platinotypes! And do not the delicately tinted daguerreotypes of bygone years give us a closer acquaintance with our grandmothers than the hard and unyielding silhouettes, despite the exquisite delineation of character in the latter? And yet the tinted daguerreotype had only a suggestion of color.

As further proof of this, witness the unending quest of photography in colors, and the instant popularity of any process which promises to complement the fidelity of the photograph with the delight of color. Travelers abroad will recall the widespread sale of the Photochrome-Zurich prints of continental scenes, often garish in their brilliancy of tint, but preferred by many before the plain photograph, as bringing to mind something of the rich coloring seen under the skies of southern Europe. Nearer home we have the suggestion of color in platinotypes and carbon prints, as practiced by Mr. Stieglitz, Mr. Keiley, Mr. Eickemeyer and others, and the gum prints in several tints exhibited by the brothers Hofmeister. These instances embrace the two extremes in colored photographs, but they serve to show the general desire for color. The continental prints are produced by a mechanical process based on the photographic image; the tinted platinotypes are colored by chemical methods at best difficult and uncertain. In this little book we are to follow the *via media*, dealing with the old-fashioned but satisfactory methods of using brush and color with such skill and discrimination as we possess.

Before starting out upon so questionable an adventure as the actual coloring of a photograph, many things should be carefully considered. First we need a thorough knowledge of colors and their combinations, next a large measure of caution and taste, and, finally, abundant restraint. All these must be acquired before we can talk intelligently about the technics of coloring. The evil repute of the colored photograph is, as a matter of fact, most largely due to the neglect of these essential preliminaries. Let us make haste slowly. Not every photograph can be colored to advantage; rather, very few. And a little color goes a long way. Certain subjects are better left uncolored, the photographic rendering, with careful choice in the selection and manipulation of printing papers, being sufficient for their adequate representation. I have at hand a platinotype portrait of a child in white draperies, so cleverly handled in lighting, negative-making, printing and mounting that the addition of positive color would detract from rather than add to its beauty. It is one of those rare photographs which an artist would speak of as being "full of color." Some marine pieces by Bolles, and others by Worsley-Benison, although simple photographs, have this quality which makes coloring superfluous. On the other hand, we may have a portrait which needs a mere wash of color to suggest flesh, the draperies and background being left untouched; or a scene at eventide, full of delicious shadows, which lacks but a touch of ruddy gold at the horizon to complete the illusion of nature. In coloring photographs, therefore, it is quite as important to know what to leave out as to know what to put in, and how, and where. Thus I have a picture of a rose which lacks a simple wash of color to give me the keen pleasure I had in the delicate color-glory of the flower itself.

Then, again, there are prints which require vigorous coloring for their proper interpretation. A photograph of the Lower Church of San Francesco, at Assisi, seems cold and barely interesting in the monochrome of the bromide print. A duplicate print, treated with broad masses of transparent color, fairly glows with memories

of the glorious frescoes by Giotto with which that unforgettable interior is enriched. In professional coloring, of course, there is less room for choice of this sort, as the work is done to order. Here the bill of particulars concerning Mrs. Smith's jewels, hair, complexion and dress must not be overlooked or tampered with in any detail. But even in such cases individuality and good taste can work wonders. The fault of over-much or too bright coloring is chiefly in evidence. The effectiveness of quiet coloring in small spaces is too frequently overlooked, with the result that Mrs. Smith is decked in colors rivaling those of the modern fashion-plate. The remedy lies in a clear understanding of the principles of harmonious coloring, of the gradation of colors as seen in natural objects, and in the exercise of restraint and common sense.

Given the necessary knowledge and skill in the colorist, success depends in no small measure upon the character of the print to be colored. Expert colorists are scrupulously careful in this detail, and it will profit us to give it consideration. The average photograph is too dark and heavy in tone, presenting a conglomeration of obtrusive details and opaque shadows which no reasonable amount of color can enliven or disguise. The characteristic hue of the photograph stares at us from beneath the film of color, dulling and overpowering the delicate gradations of tint upon which the colorist depends for his effects. We need what is known as a soft or light print, i.e., one in which all the gradations of tone in the original are fully indicated but not printed out to their usual depth of contrast. For the same reason, the print should be warm in tone, with transparent shadows, rather than hard and cold in character. A duplicate print, fully printed and finished, should be kept at hand as a guide during the coloring, as even a light wash of color upon the features in a portrait will often obliterate the subtle gradations of tone upon which likeness depends.

Platinotype prints without large masses of shadow, or with the background and accessories subordinated in printing, offer obvious advantages over the glossy

print. In fact, the less photographic body-color the print possesses, so much the better print is it from the colorist's point of view. Thus carbon prints in sepia or bistre are preferable to the ordinary carbon portrait printed in photographic brown or other dark tissue. We cannot always control the character of the original print, but wherever possible these details should have careful attention as influencing the final result. The difficulties presented by different classes of prints are fully appreciated by professional colorists, and they wisely endeavor to secure every possible advantage before taking up the actual coloring of a print. Old photographs sent to be colored are usually albumen or other silver prints, presenting difficulties in surface texture and color. In such cases, if we must attempt their coloring, there must be compromise. The modern print, generally platinotype, carbon or matt collodion, offers a simpler problem and often lends itself to the happiest results. The finest color work of recent years has been done either on platinotypes specially printed for the purpose, as outlined above, or on a carbon base (on celluloid, ivory or opal) in which the opaque portions of the image had been reduced or removed previous to coloring. In selecting prints for his first attempts the reader should choose those in which light tints predominate, of which the frontispiece of *THE PHOTO-MINIATURE* No. 43 offers a ready example. The immediate preparation of prints for the application of colors will be dealt with later.

Color
Pigments With these preliminaries disposed of, we can now consider the working equipment of the colorist, his tools and materials, beginning with the colors or pigments used and their harmonious combination to secure the illusion of natural effects. The harmony of colors is a big subject—too big, in fact, to be handled here in a satisfactory way; but I will endeavor to give a few hints which will serve as the first steps.

Color
Pigments Colors are usually divided by artists into three classes, viz.: primary or simple colors, secondary, and tertiary. Red, yellow and blue are commonly spoken of as

primaries, since by combining them in various proportions, either by twos or all together, these three colors produce every hue and tint in nature and in art. This theory is not scientifically correct, the true primaries being red, green and blue-violet. The scientist, however, deals with pure colors, which are found only in the spectrum. The artist is concerned with pigments which are far removed in purity of hue from the colors of the spectrum. Hence, so long as we deal with pigmentary colors, red, yellow and blue may be regarded as satisfactory primaries or simple colors.

Secondary and Tertiary Colors When combined in twos, the primaries produce the three so-called secondary colors. These are: orange, the combination of red and yellow; green, the combination of yellow and blue; and purple or violet, the combination of blue and red. Thus the primaries and secondaries together constitute the six colors of the spectrum: red, orange, yellow, green, blue, and violet, as seen when a beam of white light is analyzed by means of a prism.

Further combinations, in pairs, of the secondaries produce what are called tertiary colors, but more properly known as hues or tints. Thus green and orange produce citrine; orange and purple make russet; purple and green make olive. These tertiaries are thus seen to be compounds of the *three* primaries — as the secondaries are of *two* — one of the primaries, however, predominating. Similarly the grays and browns are compounds of the three primary colors, in unequal and varying proportions.

Complementary Colors Those colors which, with any color or colors mentioned, make up the three primary colors, are called complementary. If the given color is a primary, its complementary is the secondary formed by the combination of the other two primaries. Thus,

Orange = red and yellow, is complementary to Blue;
 Green = yellow and blue, is complementary to Red;
 Purple = red and blue, is complementary to Yellow.

If the given color is a secondary, the complementary color is the remaining primary. Thus the comple-

mentary color of green, which is composed of yellow and blue, is red. Similarly, when we combine two secondaries we produce a tertiary, which is complementary to the remaining secondary. Thus,

Citrine = orange and green, is complementary to Purple;

Olive = green and purple, is complementary to Orange;

Russet = purple and orange, is complementary to Green.

These combinations may be pursued indefinitely with similar results. The interested reader will find them fully set forth in text-books on the harmony of color, which may be studied with much profit.

The contrast of color is either simple or compound. Each of the primaries, for instance, forms a simple contrast to the other two. Thus, blue forms a simple contrast to red and yellow. But if red and yellow are mixed together, the complementary color to blue will be formed, viz., orange, which is the most powerful contrast to blue obtainable. From this we get the principle that to secure strong contrast in coloring, we should oppose one color to its complementary. The opposition of red and green in the golfer's costume is an example of this.

Colors are termed cold or warm according to the visual sensation they produce. Thus red and yellow, with their mixtures, are called warm colors, conveying the sensations of light and heat. Warm colors are also supposed to bring objects near to the eye and so are often spoken of as advancing colors. Contrariwise, blue and those tints in which blue predominates, are called cold or retiring colors, as suggesting coldness and distance. Of the secondaries orange, being the most luminous, is the harmonizing link between yellow and red. Green is considered the mean between orange and purple, thus occupying a middle position between light and shade. It is the color most found in nature and is grateful and refreshing to the eye. Purple, the coolest and darkest of the secondaries, has much of the retiring qualities of its chief primary blue. Next to green, it is least fatiguing to the eye and conveys the sensation of

richness and elegance. Its various compounds give us many of the colored grays. The mixture of white with a color gives what is known as a *tint*, the mixture of black producing a *shade*. This is well displayed in that useful chart, Prang's "Standard of Color," which every student of coloring should possess. Black and white are regarded as complementary one to the other.

The Harmony of Color My intention in these notes on colors and their effects has been to awaken in the reader an appreciation of the harmony of color, as seen in nature and in art. The power to perceive this harmonious relation differs largely in individuals. Those who unconsciously appreciate this harmony of colors are said to have "an eye for color," just as some people have "an ear for music." With many this power is a natural gift, but it is important to know that we can cultivate this appreciation of the harmony of color by diligent observation of the color arrangements seen in nature, and in the disposition of color for the production of pleasing effects in the works of painters of repute. To suggest this study a few hints will suffice. A northern sky will be found to harmonize with a northern landscape, and the colors composing the one will be found in the other. If a painter were to paint a tropical sky over a northern scene, the lack of color harmony would be plainly apparent. The gaudy-colored costumes of the women who accompany the street organs seem strangely out of place amid the gray and somber colors which predominate in our northern cities, while in Italian towns they are perfectly "in keeping" with the local coloring.

The study of color combinations and effects in works by masters of painting is not so simple a matter. Every artist has his own scheme of coloring, and twelve paintings of a scene by as many artists would show widely different notions of the coloring of the scene. As Zola said: art is nature seen through a temperament. It has been suggested that the scheme of coloring peculiar to Watteau offers advantages for study by the photographic colorist, because of its delicacy and freshness of tints. Similarly, it is obvious that we can profitably study the paintings of Sargent, Alexander, Oules, Leighton,

Millais and Alma Tadema, although the coloring in each will differ widely from that of the others. A little observation of this sort, and an intelligent grasp of the preceding pages, should suffice to set the reader thinking and working along right lines, and prevent the gross blundering which has earned an evil repute for the colored photograph "as it is done."

**Buying
Materials
and Tools**

Let us take up the practical details. For coloring portraits with water colors we will need a small outfit of water-color paints, brushes and a few working conveniences suitable for this method. A glance over the supplies displayed by the artists' colormen ends in bewilderment. First, let us draw a line between colors proper, and the numerous ready-prepared "tints," "dye-colors," "liquid colors," and "washes" advertised as offering an easy means of coloring. These are all very well in their way, but we are not concerned with them here. So we will follow the advice of an experienced colorist, Miss M. Phillis Bell, whose instructions and methods will occupy the remainder of this monograph. In providing a set of water colors for painting photographs only the best should be chosen, and it is advisable to keep to those of one maker only; colors made by different firms should not be mixed. Those made by Winsor & Newton (England) and by Bourgeois (France) are good, as are also some by German makers. The writer has personal experience of the former only. It is not necessary to begin with a large variety of colors at first, as only a few colors are really required; others can be provided later as the necessity for them arises. It is easier for the student to remember the combinations of a few colors than if the whole range were laid before him in all the bewildering variety of combinations of which they are capable. There is no hard and fast rule in the choice of them; some artists get their effects by using a certain set of colors, to which they keep with but little variation, whereas other artists prefer probably almost an entirely different set of colors. The following, however, will be found to be reliable, and the best that can be recommended after many years of experience.

Burnt Sienna,	Pink Madder,
Brown Madder,	Raw Sienna,
Cobalt Blue,	Burnt Sienna,
Chinese White (tube),	Raw Umber,
Indian Yellow,	Sepia,
Indian Red,	Vandyke Brown,
Indigo,	Venetian Red,
Lamp Black,	Vermilion,
Neutral Tint,	Yellow Ochre,
Naples Yellow,	Light Red,
Cadmium Yellow,	Roman Ochre.

The colors may be obtained in either cakes or pans, but those in cakes will be found more economical, and will keep better and cleaner. Some hard and soft pastels, for use in backgrounds occasionally, should be added, colored and gray; a few colored pencils (*creta lavis*) in wood, a bottle of good gum water, and a bottle of prepared ox-gall. A porcelain palette is a necessity; a few little china saucers in which to mix large washes of color will be useful, and two or three porcelain tiles with divisions.

Sable brushes are best. They are made in both red and black hair. The red ones are generally considered the best; they are a little stiffer than the black ones, and are better for working in body color. The black ones are better pointed and finer, and more suitable, therefore, for very fine and delicate work. Do not choose very *small* brushes. It is a mistake to work with too fine a pencil, and so get into a *niggling* method of laying on the color. The most suitable sizes are from No. 2 to No. 7. The middle sizes are best for painting the face, except in very small miniature work, and the larger ones for the hair and drapery. Test the brushes when you buy them by wetting them, and see that the hairs keep together, and come to a straight and even point. Choose those that are mounted in tin and not in quills, as the former are firmer, more serviceable and wear better. It is useful to have a few camel's hair brushes for wetting the prints with, and putting in broad washes in background and drapery, and have also a flat camel's hair brush for softening the edges of washes when the

color comes too strong and harsh. An eraser, a crayon stump, india-rubber, and a scalpel or sharp pen-knife are all necessary to the outfit, and some fine pumice powder for rubbing on carbon prints to obtain "tooth" when such have to be painted.

The photograph to be worked upon should be fastened to a drawing-board, with pins at the corners. If the board be placed upon a desk or table, the hand will necessarily rest upon the lower part of the photograph in working. To prevent any grease or moisture from the hand touching the print, a sheet of paper on which to rest the hand must be laid over the photograph, or, better still, a mask may be cut out of gray filter-paper to cover up all of the photograph except the part to be colored. The cool gray color of the paper is pleasant to the eyes, and the vision is not distracted by any glare of white paper. It is best, however, to place the drawing-board on an easel, if possible, and the hand should be supported by a mahl-stick. This enables the student to see his work better, as it can be placed at any height or inclination; and the position of being able to look straight *at* the work on a level with his eyes is much healthier than when he must bend and look *down* upon it when it is laid upon a desk or table. The easel should be so placed that the light will fall upon the work from the left and a little to the rear. This will prevent any shadow from the hand or brush intercepting the light, and will also protect the eyes from the glare of light shining into them. Care must be taken, however, that the light should not come so far from behind as to cast any shadow of the head upon the work. The light should not be too strong, so that a broad, mellow touch may be cultivated, instead of one of extreme particularity and hardness. A window facing north is, therefore, the best, as affording a steady and quiet illumination.

The photograph selected for coloring may be printed by one of several processes. If it is an albumen print, the glossy surface will require preparation. First wash the print carefully with a clean, soft sponge and water—

very little water. If any signs of greasiness appear, again rub the surface of the print evenly and all over with a moist rag dipped in water to which a little of the prepared ox-gall has been added. Do not use too much water or ox-gall solution, and do not rub the surface of the print more than is absolutely necessary. Glossy gelatine prints (unburnished) require no preparation, but glossy collodion prints should be prepared by a coating of Acme Medium, obtainable from artists' supply stores. For matt collodion prints the Acme Solution (different from the Acme Medium) is advisable. I know of no other preparations or formulæ which will do the work of these specialties, hence I am obliged to advise their use.

Preparing the Palette To prepare a palette of colors, begin by rubbing a little pink madder with clean water on the right-hand side of the

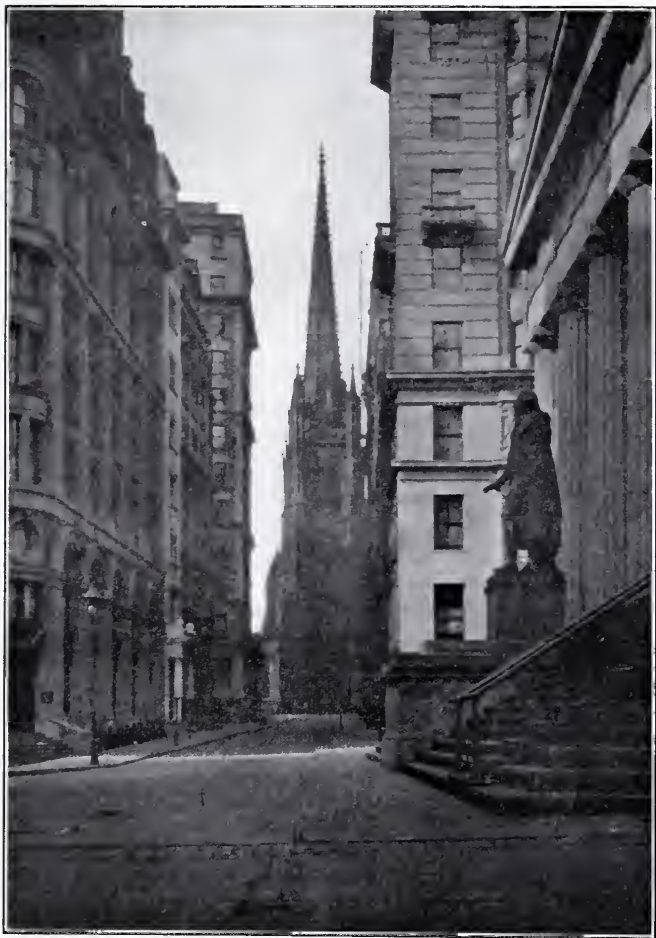
palette; then, a little to the left of this, rub some raw sienna, and just over the space between a very vermilion. In the middle of these three colors draw together a little of each (much less of the vermilion than of the others) until the proper shade is produced. This will form a good flesh tint for medium or fair complexions. For dark complexions a little Vandyke brown should be added, and for ruddy ones a little more vermilion. If the print should be dark originally a small proportion of Naples yellow should be mixed with the wash.

The First Application When the flesh color has been mixed to the right shade it should be flowed evenly over the whole of the face with a medium-sized brush (or large brush if the picture be a large one) extending a trifle over the outline of face, neck, etc., and going slightly on to the hair.* Be careful that every part of the flesh is covered, and try to keep the color of the same density throughout. Then leave it to dry, which it should do without leaving any streaks or markings of the brush. If it should not be

* It should be stated, however, that in platinotype paper this cannot so easily be done, as, the paper being porous, the color sinks in and cannot very well be removed or softened. The wash, therefore, for platinotypes should cover *only* the part intended and be put on with a brush not too full, but with only sufficient color to cover the space required.

right, dip the brush in the color and try again; and also do this if the color should be found to be too red or too yellow, in which case the proportions must be altered. But remember that the first wash of color is deceptive, and what may seem too bright at first will appear much paler, and more toned down, when the deeper tones are put in of shadows, hair, eyes, lips and the carnation in the cheeks. The addition of background and colored drapery will also tend to soften and tone down the whole. In my early experience I remember having to add more color by stippling it in afterwards in portions where at first I had thought the wash too strong. When the color is quite dry, the parts of background, dress, the eyes and hair (except when the hair is auburn) over which the color has flowed may be cleaned off carefully with a just moistened brush. The object of carrying the color beyond the actual part to be painted is that the outline of the face and neck shall be *clean*, and without any line of color, as there might be if the wash were carried just to the edge. It is so easy, too, with a brush and clean water to wash away what is not wanted, but the brush must be *just* moist, as stated, and the work done from the edge of the face outward, or partly down and outward. It is convenient to have a small sponge at hand with a hollow center, which has just been wrung out of clean water, in which the brush can be moistened and pointed. It is a good thing also to have a piece of clean white blotting paper ready on which to try colors, and point the brushes. Never point the brushes in the mouth.

Hatching and Stippling These are the two methods of laying on the color after the first wash has dried. Hatching is adapted to working in the shadows of the face and neck, but more especially to the drapery and background. It consists of little short straight strokes firmly laid on in rows, following the general lines of the part being worked upon, i. e., the shadows of the forehead should be put in with horizontal lines, the eyes should be worked round, the nose shaded with vertical strokes, the chin, shadows of the cheek and neck with lines following the general contour of the face. Have the brush nearly



WALL STREET, NEW YORK

Looking from the Treasury Building toward Trinity Church

Made with No. 10 needlehole; plate distance, 8 inches; Cramer Instantaneous Iso plate,
 $6\frac{1}{2} \times 8\frac{1}{2}$; exposure, 60 seconds

James H. McCorkle



PORTRAIT
C. R. Reeves

dry, and put these touches in by pressing firmly on the brush at the beginning of the strokes and carrying it on to the end, being careful not to leave a little dot of color at the finish. These lines must not be too close together, as after the cross lines have been put in, the ground wash should show through. When the first hatching is dry, cross these lines with others of the same kind, but *not at right angles*, not too *obliquely*, but at an angle of a little less than forty-five degrees right and left of a perpendicular. The work should be tolerably open, and should be light or heavy according to the depth of the wash upon which they are worked. The effect should be to give transparency and depth to the shadows. It would be an advantage to the student to study the modeling of a good line-engraving at this point, and see there how the lines follow the formation of the face, figure and drapery. It should be a good object lesson in the process of hatching. If the hatching should appear coarse when looked at with the light coming in the opposite direction from that in which it has been worked, turn round, and work the picture a little in different lights, sometimes just softening and blending the lines with a clean moistened brush. If the color should appear too dark, hatch over it with a clean damp brush, and when dry, rub the surface gently with a soft, clean handkerchief: this will remove the loosened particles of color.

Stippling is the usual method of working on the higher lights of the picture. It consists of laying on the color in little dots and touches with the point of the brush. The fineness or coarseness of the touch must be adapted to the size of the photograph. In the case of a small head, the work must be fine, but in that of a large one the touches should be bold and strong and not so close together.

Resuming the coloring of the photograph: The lips must be touched in with a little pink madder and vermillion.

Shade them with deeper color in the darkest parts, and mixed with a little white in the lighter parts. Then, with the same color—pink madder and vermillion—put in the bloom in the cheek. Begin by stippling

in the center of the cheek with but little color, using nearly a dry brush, and do not touch twice on the same spot while wet, or the under color will rub off; be very careful about this. Work first on one cheek and then on the other, a little at a time, afterwards filling in between. If the brush be not too moist, the touches will merge imperceptibly into the flesh tint. When the cheeks are finished, work in the shadows of the face with light red, to render them warm and luminous, and also transparent. Where the shadows are not too dark, and especially in the portraits of fair-complexioned ladies and children, pink madder may be used instead of light red. The shadows of the forehead must be hatched or stippled with this warm tone; also round the eyes, and touch the inner corner of the eye; also down by the side of the nose, round the nostril (the shadow-side only, not the light); the nostrils themselves, the dent in the upper lip, under the lower lip, round the chin, and in the shadows of the neck and ears. The highest lights on the forehead and nose may be put on with Naples yellow and white. Stipple up any portions of the face which may seem to need more color, or require softening or blending, and stipple with a light tint of cobalt round the hair where it joins the flesh, and round the edges of all shadows. This will give a soft, pearly hue, softening and blending lights and shadows together. But be careful not to show a decided blue. If the eyes to be colored should be light blue, they must be done with cobalt; if dark blue, with cobalt and indigo; if gray, cobalt, light red and black; if hazel or brown, with light red—which shows brown over the dark photograph. Touch the iris with the color, then put in the light speck, where it is indicated in the photograph, with white, just tinged with a trifle of the eye color. Be careful about the speck, not to make it too large or staring, and get it in the right position; also denote the reflected light on the opposite of the speck. The pupil should be painted with black and sepia, and may often be made a little larger, with advantage, than it appears in the photograph, but care must be taken not to alter the shape or position. The

white of the eyes may be put in with Chinese white, slightly toned with gray.

If the hair be light yellow, a wash of raw sienna may be used, and when dry, stipple the high lights with Naples yellow, and work the shades with Vandyke brown or sepia. Flaxen hair is best shown by a wash of raw umber, thin light red in the shadows, and Naples yellow in the lights. For light brown hair Vandyke brown is a good color, with sepia in the shades, and Indian yellow or Venetian red in the lights. For the various shades of brown hair these are very good colors to use, as light brown or dark brown can be represented by heightening the lights or deepening the shadows. For dark brown hair a little black must be added to the sepia for the deepest shadows, and a bluish tint of gray and indigo for the high lights. Black hair must be painted with neutral tint, sepia in the shadows, and the high lights stippled with indigo and white. Red hair should be painted with burnt sienna for the local color, the shadows with sepia and brown madder, and the high lights with Venetian red. Gray hair is often tinged with a yellowish hue; for this give a wash of pale Vandyke brown, and shade with a gray made of cobalt, black and light red. The lights should be touched with white, tinged with Naples yellow. For cool silvery hair a wash of the gray only may be used, touching the lights with pure white. For iron-gray hair use black and cobalt as a wash, with sepia in the shadows, and a touch of white on the lights. In painting hair lay the color on in broad touches with a good-sized brush, following the lines and formation of the hair. Do not try to paint in stringy lines and single hairs; bring the shadow color partly over the lights, and the color for the lights partly over the shadows, with the local color showing through; paint it in soft masses, preserving its form and character. Put in the shadows first, when the local color is dry, and do not use any opaque color; the shadows must be clear and transparent. The high lights must be put on last with very little color in the brush, with sweeping touches here and there, and showing the local color through. The edges of the hair as

it comes against the background should be light and feathery, so as to relieve the head, and prevent the appearance of its being cut out and pasted upon the background. Gray (or neutral tint) should, therefore, be worked into all edges and receding parts.

The eyebrows and eyelashes must be Eyebrows painted the color they are in nature; generally this is a shade darker than the hair. Do not try to define the eyebrows with sharp strokes to represent single hairs, but in broader touches and with some gray and a little light red worked in. The eyelashes should also be represented exactly as they appear in the photograph. Generally it is enough to draw a dark line over the edge of half the eyelid, and on the other half to indicate the sweep of the lashes with two or three breaks as they appear against the cheek or background. But this must depend altogether on the position; as before stated, keep exactly to the drawing of the photograph, and do not try to give abnormally long and thick lashes, as the effect would be unnatural and ridiculous.

When the face and hair are practically finished, a little gum mixed with water should be passed lightly over all the shadows with a medium-sized brush to give depth and transparency. It must be done with one light sweep of the brush (so as not to disturb the under color) over each part, viz., in all the shadows of the hair, the eyebrows, the eyebrows themselves, down the shadow side of the nose, the nostrils, the shadows of the lips, under the lower lip, the shadows in the ear, about the neck and under the chin. But use it sparingly, diluted with water, and, as before stated, only in the shadows and avoid the appearance of gloss.

The hands, if they appear, should be Hands painted with colors similar to those used for the face, but rather lower in tone. The shadows between the fingers should be put in with brown madder, or if they are already rather dark, use light red or burnt sienna. Use gum in the shadows and also some gray, and tip the finger ends with pink madder.



HOME OF GILBERT WHITE, SELBORNE, ENGLAND
F. Mason Good



HOME OF GILBERT WHITE, SELBORNE, ENGLAND
F. Mason Good

**Black
Draperies**

Having completed the portrait, the dress and background must now be considered. If the dress be black, and the portrait a good one and of a warm brown tone, this can best be rendered by a wash all over of a mixture of cobalt and indigo, or simply Prussian blue—a transparent greenish blue not previously mentioned in the list of colors. The shadows should be worked over with brown madder and sepia, and the high lights stippled with black and white. If the print should be more of a bluish tone, then the wash should be more of a purple hue, with shadows of brown and pink madder as above. A good general mixture for black drapery, which can be varied according to the tone of the photograph, is composed of indigo, pink madder and sepia; this, mixed in varying proportions, will give almost any tone of black that may be desired. Remember that the shadows must always be painted with a warm brown, and afterwards (when quite dry) coated with a little gum in water.

The white collar and shirt front in a
Linen gentleman's portrait should be represented by a mixture of cobalt, raw

sienna and rose madder for the delicate middle tones, the deeper shadows with cobalt and Vandyke brown, and the deepest with cobalt and sepia, or neutral tint and Vandyke brown. For the high lights use Chinese white. The edges of the black coat or cravat would appear very hard against the white front; therefore a softening tone of gray must be interposed on the white where the black overlaps to connect and bring the two into harmonious relation.

**Colored
Draperies**

Colored drapery can be painted in any shade that may be required by mixing the primary, secondary and tertiary colors as described at the beginning of this little manual, with white for the highest lights, and black for the deepest shadows. Remember that the local color comes in the half-tones, the shades must be dark and warm, and the high lights cool. Always put the local color in first, then the shadows, and lastly the lights, and do not overlook the *reflected* lights at the bottom of large folds. Use gray in the receding parts and on the

edges of all shadows. White drapery should be shaded with a gray composed of cobalt, sepia and light red, slightly cool in the half-tones, and warmer in the shadows by varying the red and blue; the very high lights only to be touched with Chinese white. Cream color may be shown by a thin wash of raw sienna; and coffee color by a mixture of burnt sienna and Vandyke brown, tipping the lights with white mixed with the tint.

Scarlet is perhaps the most difficult color to truly represent on a photograph. Vermilion is perfect for it on white paper, but on a photograph the color of the print shows through, and red, being a non-actinic color, is always represented too dark in a photograph—so that the effect of vermilion, instead of being scarlet, is that of a dirty brick-red color. If white be added the effect is pinky. Yellow should therefore be mixed with the vermilion, or a better plan is to give a thick wash of cadmium yellow all over the coat, buttons and lace (if the subject be a military costume), and when dry, paint over that with vermilion mixed with a little white and some of the same yellow. This will effectually hide the dark ground, but it must be well put on, with all the shadows carefully reproduced, or the effect will be garish and vulgar. When dry, go over the work again with a mixture of vermilion and pink madder, using a large brush, and being careful to work lightly, so as not to disturb the color underneath, and do not touch the color a second time while wet. The shadows must be worked in with burnt carmine and brown madder mixed with gum and water, and in the deepest parts sepia may be used; the lights to be put in with a mixture of cadmium yellow, Chinese white and the local color.* The gold lace and buttons on the coat, which so far have only had a wash of cadmium yellow must be shaded with Vandyke brown and sepia, and the high lights tipped with Naples yellow, rather thick, but sparingly, and just dotted on with the point of the brush.

* It is necessary always in painting a photograph in body color (as in the case of this red coat) to have a duplicate copy at hand as a guide for the preservation of the correct drawing; indeed it is advisable always to have one, even when only transparent colors are used, for frequent reference to the delicate degrees of shading and modeling.

So far nothing has been said about

Jewelry painting jewelry. Gold should be indicated by a wash of Roman ochre, shaded

with burnt umber and with burnt sienna in the deeper parts; the high lights should be touched with Indian yellow and Chinese white, dotted on. In painting precious stones, the local color should be the same as that of the stone itself, with deep touches for the shadows, and brilliant light effects, sometimes finishing, as in the case of diamonds, with a touch of pure color. Remember also to work in a reflection of the color of the drapery on which the stone is pinned.

The background is the next consider-

Background ation. The nature of it will depend

upon the kind of subject being worked

upon, whether the scene be an indoor or an outdoor one, the figure a full length or a three-quarters length, or simply a vignette of head and bust. Whichever it be, the character of the background must be in harmony with the subject of the picture. It should be quiet and retiring in tone, and have the effect of giving relief to the figure by suggesting atmosphere and aerial distance. If the picture be a full-length one, and a photographic (scenic) painted background has been used, showing, perhaps, an impossible room, or staircase, or curtain, with some articles of real furniture to complete the composition, it may be necessary to alter the background somewhat in order to give it a more real and home-like effect. Part of it may, therefore, have to be painted out. A very good neutral gray for this purpose is composed of Indian red and chrome green in equal proportions. It makes a flat wash which, when properly applied, effectually covers up any part which it may not be desirable to reproduce in the finished picture. When the wash is dry, it must be hatched over with some transparent color to give it distance; otherwise the figure would have the appearance of being sunk or inlaid. Vandyke brown or sepia mixed with cobalt are suitable for this purpose. Sometimes a little dry color rubbed on with the ball of the finger will have the desired effect; this is an expeditious method, but would only be suitable for

large work. The *tone* of the background must harmonize with the general coloring of the picture, i. e., the colors should be repeated in the background which have been used in the rest of the picture, only in a quieter and more subdued tone. As a general rule, the shading should be dark behind the light side of the face, and light behind the dark side. The background should be unobtrusive and receding, i. e., painted with the opaque colors giving distance, so that, in looking at the picture, nothing in it may take the eye away from the face. Broad washes of color are most suitable varied in degree of density according to the depth of tone required, and hatched in the darker parts with some warm brown color.

The woodwork of furniture may be Furniture painted with warm sepia and pink madder, with brown madder in the darkest parts. Venetian red or light red would be suitable for mahogany; burnt umber and sepia for walnut, and yellow or Roman ochre for oak. The high lights on polished furniture are grayish blue, and should be distinctly laid on with body color, the highest lights of all being white. Gum water should be afterwards brushed over all the shadows, the color of the cushion, tablecloth, or curtain should be made to harmonize with the flesh and drapery; the pattern should not be worked much in detail, except perhaps in one little spot on which the light is more concentrated; the rest should be broken up, and not worked with any distinctness. The floor should be painted with short horizontal lines and touches in order to give the effect of breadth and space; perpendicular lines would make the floor appear as if it were running up towards the back of the picture.

If the background be a landscape, the sky in the uppermost part may be put in with pure cobalt, shaded with light red down towards the horizon, when some yellow should be added; clouds can be imitated with light red, cobalt, and black in different proportions. Distant hills can be represented with cobalt, light red and rose madder, and foliage with yellow ochre, light red and cobalt. Trees in the foreground and grass

should be painted with gamboge (a color not mentioned in the list), burnt sienna and indigo; stems and trunks with Vandyke brown, and lights with pure gray.

But more often the photograph to be
Vignettes colored is a simple vignette of head and bust only. The background should be sketchy and present a cloud-like effect, and as if the person were seen against the sky. A wash should be prepared of blue-gray, which may be shaded with brown; or a green shaded with burnt sienna; neutral tint with yellow or green; or olive-green with a warm brown. The background should first be wetted with a camel's hair brush—if the print be platinotype—and then the wash, well diluted, flowed irregularly over the space intended, leaving the edges broken and leaving two or three spaces white as if they were breaks in the clouds. With a brush dipped in clean water, go over the upper edges of the cloud forms to take off the superfluous color, so that they shall not dry with a hard line or ridge; break up the edges into delicate fleecy tracings, but leave some of the lower edges of the clouds dark to represent their shaded side. When the wash is absorbed, lay on another darker tint, keeping it within the outline of the first wash, but not at a regular or even distance, nor keeping in any way to the form of the first. The idea is to represent clouds which are light and fleecy, and that come over one another in an irregular shape. One or two washes will probably be sufficient, at any rate for that side on which the face is in shadow; but a third wash may be required for the other side in order to give relief to the face and balance the shading. When the washes are dry, the clouds may be delicately hatched over, showing the wash color through; this will give an ærial and atmospheric effect which will tend to make the background recede, and the head to stand out. When the shadow side of the face is very dark, the effect may be lessened by projecting a shadow of the head on to the clouding at a little distance from the head, and on the shadow side, but be careful not to destroy the effect of atmosphere. The hatching and stippling necessary to obtain a cloud-like effect must be done with faint but

decided lines and touches; the edges of the clouds must always be lighter and more delicately handled than the central parts.

Miniatures on Ivory For painting miniatures on ivory the general instructions given in the preceding pages are applicable, only that for this work the painting must be solid, so that the photographic basis on the ivory shall not show through. I say photographic basis, as we are concerned with painting photographs, and not with miniature painting proper. Very beautiful results can be secured, however, notwithstanding the photographic basis, and I have seen hundreds of miniatures painted in this way, in which no trace whatever of the photograph could be found except by a very skilled eye.

The photograph, which should be printed in sepia carbon, supplies the drawing which ensures a correct likeness for the foundation, and a great part of this can be scraped away with the scalpel, when the worker has acquired the necessary skill to draw and paint on the ivory base. The photograph can also be rubbed away in part, or half rubbed through, with a little fine pumice powder in places where it may be too dark, and altogether on the high lights. In this way greater purity and transparency of coloring are obtained. Use red sable brushes not too small; see that the spring and points are good. As only the points are used it is a mistake to work with very small brushes, as it tends to produce a wiry and scratchy effect. Practice a firm, mellow touch. Work horizontally on the forehead, round the eyes, the nose, round the chin and cheeks. Remember that the forehead is of a rather yellower tone, and the neck grayer than the rest of the face; also that the edges of all shadows must be gray as well as the retiring outlines of the face. The drapery and background must be painted solid, i. e., every part stippled or hatched in. It is well, therefore, to put in the colors roughly before finishing the face, so as to see how they harmonize with or affect the latter. The ivory, being semi-transparent, should, when finished, be backed with white or cream-colored paper. This will affect the general tone of the miniature, so that

both should be tried to see whether the warm or cold white paper would be more suitable.

So far we have considered the painting of photographs in water colors only. We will now take up oil colors as being equally applicable to the painting of photographs. The two processes are very much alike in many respects; they differ chiefly in the nature of the pigments used, and in the manner of their manipulation. In all the essential laws of color, light and shadow, the principles and results are the same. Before beginning to paint, the photograph must be first be coated with a sizing of fine white glue. Dissolve some of the glue in warm water and apply it while warm with a large brush. The object of this is to render the surface impervious to the oil color. When dry, test it by applying a little oil on the corner of the print, and if the oil sinks in give another coating of the size, but be careful not to have it too thick, as in course of time the sizing might crack and peel off.

The following paints, brushes, etc., will be required:

Flake White,	Light Red,
Naples Yellow,	Rose Madder,
Yellow Ochre,	Vandyke Brown,
Venetian Red,	Cobalt,
Vermilion,	Brown Madder,
Raw Sienna,	Prussian Blue,
Burnt Sienna,	Crimson Lake,
Raw Umber,	Ivory Black.
Burnt Umber,	

A dozen small-sized hog-hair brushes (chisel-shaped), six of larger size, one larger again for varnish, six small oil sables, also flat-shaped, for painting the face in small pictures; a wooden palette, of mahogany or some other hard wood, about 9 x 12 inches in size; a spatula; two or three tin dippers with covers, and a tin brush washer; add to these a bottle of copal varnish, pale drying oil, poppy oil and turpentine, and the equipment for a beginner is complete. The tin brush-washer is for use, when half filled with turpentine, for rinsing brushes in when they have been used in

one color and are wanted for another, and also for *all* the brushes when the day's work is done, but only until they can be washed in warm water with soap. Brushes must never be left in turpentine or dirty, as they would quickly get ruined. They should be washed thoroughly as soon as the work is finished and left to dry in a jar, brush ends up. Some artists use a badger's hair softener for blending the colors, but the writer deprecates this, as it tends to produce a flat and characterless effect in the finished work.

Lay out the colors on the palette in the following order: First, flake white on the edge nearest the thumb—a larger supply than of any of the following colors, as more of it will be needed; next, Naples yellow, then yellow ochre, light red, vermilion, rose madder, cobalt, raw umber, Venetian red and ivory black. These colors must be toned and shaded in two or three degrees, with the admixture of white or other colors as required, these shades to be mixed with the spatula in their order in the middle of the palette. Many of the old masters painted with only the three primary colors instead of mixing them in tints. Rubens gave very simple instructions to his pupils. He said: "Paint your lights white, next to that yellow, then red, using dark red as it passes into the shadows; then, with a brush dipped in cool gray, pass gently over the whole till they are tempered and sweetened to the tone you wish." These are very concise instructions, and embody almost all that is required in flesh painting.

Applying the Colors In beginning to paint a portrait after the sizing is dry, first paint in the shadows of the face with some transparent brown, as burnt umber or burnt sienna, sparingly, then put in the highest lights thickly with pale Naples yellow and white, then work next to that with the deeper yellow tint; follow on with two tints of light red and white, working these last partly over and into the yellow tint, but not entirely over it. Add a little vermilion to the light red for the cheeks if necessary, and also use vermilion for the lips. Different brushes must be used for the different tints; work the color on



SNICKER'S GAP, BLUE RIDGE, VIRGINIA

Henry Hoyt Moore



A MEMORY OF THE PAN-AMERICAN EXPOSITION
L. A. Weigel

in different ways, right and left, and do not try to blend them too much. Carry the darkest of the light red tints a little over the edge of the shade tint (which should have been extended a little beyond the shadow for the purpose); afterwards glaze the shadows with warm shades of lake and brown pink. Between the warm shades and the lights should be placed a cool gray tint, as also round the edges of the shadows and round the roots of the hair. The eyes should next be painted in, using white with the color so as to hide the photograph, then the eyebrows, using shade tint and white.

Hair The hair should be painted in masses, the middle tint being the real color of the hair; the high lights should be cooler and the shades warmer. Vandyke brown is a good color for brown hair, but it is a bad drying color, and therefore, a little burnt umber should be used with it to help it, and for medium copal varnish alone. Ivory black, crimson lake and rose madder are all bad driers: a light red or Indian red mixed with the black, and vermilion mixed with the lake and madder will help them. White, where it can be used, assists all colors in drying. For light hair use yellow ochre, Naples yellow or burnt umber; these mixed with white will give light hair of any shade; for the shadows use burnt umber, burnt sienna, or Vandyke brown mixed more or less with white. These three latter colors also make the middle tints for brown, dark brown and black hair. The lights of dark brown hair should be made purplish by adding a little lake, black and white; and the deep shades dark, with black warmed with burnt sienna or Indian red. Use hog-hair brushes for the hair, and follow the lines and formation of it; bring the shade color partly over the lights, and the lights over the shade, using the color rather stiff. The flesh tint should have been carried thinly partly on to the hair to cover the roots; the hair color again should be brought over this, also thinly, and with a shading of gray tint connecting the two, the effect of which should be natural and as if the hair were really growing. The student must be warned against putting on the color too thinly generally. Some colorists, especially in men's portraits, lay the

color on with a palette knife in places where it is wanted thick for effect. Of course, in painting thickly, the photograph underneath entirely disappears, and the guide print must be in constant use for reference in keeping the likeness.

After having put in the first painting
Background of the face and hair, the drapery and background must be considered. As stated in the instructions for painting in water colors, the background should be painted with the same colors as compose the rest of the picture. Therefore, having decided what the color of the drapery is to be, the background may be put in first, using up some of the colors which were required for the face and hair, with the addition of some of the drapery color. Those for bust portraits should be plain in character, not showing an entirely flat surface, but with gradations; the cool tints should contrast with the warm shadows of the face, and the lights be opposed to the dark tones. It should be quiet, receding and low in tone.

The painting of the drapery is a big
Draperies subject, and we will have a clean palette. If more colors had been mixed than were required, those that are left may be preserved by being taken off with the palette knife on to a porcelain tile or plate, and the plate placed in a dish with water enough to cover the paints. In this way they will be kept moist and free from dust, and can be taken out and used again another day. Clean the palette with a rag and turpentine. Whatever the color of the drapery may be, there should be a preliminary grounding of some warmer tone. For instance, in black drapery there should be a thin coating of light red. For the after painting of black drapery—which of course must not be attempted until the light red color is dry—mix together black, white and a little lake to the desired shade; for the high lights the same but with more white; and for the shades lake, brown pink and a little black. The shades must be made warm and transparent. Begin by putting in the shadows very broadly with the shade tint, then the deepest shadows of all with black mixed with the shade tint, then the middle

tint over all the other parts, and lastly the lights which, being painted over the middle tint, will blend softly with it. If the material be glossy, as silk or satin, the high narrow edges of light should be put in with more white when the first painting is dry, but if the material be dull it can be finished at one painting. For painting a red coat very much the same instructions should be followed as in water color painting with the same colors. Cover the ground thickly with a coating of light red, yellow ochre, and white, to bring it to an orange tint, and paint the shades with Indian red. On this paint with vermilion alone, adding white for the high lights, shade with lake and Indian red, and add a little black for the deepest shadows. When dry, glaze all over with thin carmine.

It is not necessary to consider the combinations for all the colors in drapery, remembering how every shade and hue can be obtained by the admixture of the various primary, secondary and tertiary colors; but it will be sufficient to reiterate that the shades must always be warm and the lights cool.

The Second Painting The picture, after the first painting, should be left at least two days to dry.

It is advisable, therefore, that two or three works should be in hand at the same time. It is a change and rest to the mind and eye to go from one work to another; and at a fresh coming back, faults are more clearly seen, and a better comprehension is gained of how the picture should look when finished.

When the first painting is dry—which you can test by breathing upon it, if dry the breath will quickly disappear—it should be rubbed all over with a clean damp cloth or wash leather; afterwards rub it all over with a dry rag moistened with poppy oil, and then with an old silk handkerchief. This must always be done before repainting on already dried colors. Go over the face and correct whatever may not be right. If too red, a thin glaze of raw sienna should be coated over it; if too yellow or pale, a coating of thin rose madder. Touch up the lights, and carry the shade tints where required over the edges of the lights. Do not carry the lights into the shadows at this second painting of the

face, but blend them with blue as before. Touch the lips with pure color, and paint the eyes and eyelids, using sable brushes. Correct the painting of the hair; observe its formation, carry the lights over the shadows and the shadows over the lights, partially, to give lightness and texture to the hair, observe its flow and character, and indicate its reflections. Next go over the background again, finishing the part round the head so that loose hairs may be afterwards put in to take away the cut-out appearance. Correct the drapery by glazing and putting in sharp lights if required.

The picture may be touched up as many times as are necessary, but the student is warned against doing too much; the colors should be pure and fresh, and if they are mingled and worked upon too much all the character and life will be lost.

Here we must make an end. Miss Bell has done her best, but I am sure that many will agree with me that the art of coloring cannot be taught in books. We have turned the matter over, however, and know what colors to use and how to apply them. Skill and mastery can come only from experience in the work itself. As helps in this, the reader is again urged to study the arrangements of color observable in nature and in paintings. The few books likely to aid in the practice of coloring follow herewith.

BOOKS

The Theory of Coloring. By J. Bacon; published by Rowney (London). Price, 50 cents.

Photographic Painting. By A. H. Bool. 1891. (English.) Price, 50 cents.

Seven Methods of Coloring. By Frank B. Clarke. 1901. Price, 50 cents.

The Photographic Colorist. By J. W. Neville. 1895. (English.) Price, 25 cents.

The Art of Retouching Negatives and Coloring Photographs. By Robert Johnson. This contains valuable instructions on the practice of coloring, and is the best guide available at the present time. (English.) 1901. Fifth edition. Price, \$1.

Notes

In a recent lecture before the London Camera Club, Mr. Sanger Shepherd promises a practical process for producing photographs in color on paper. Such a process will be a big advance on the best methods at present available, as detailed in *THE PHOTO-MINIATURE* No. 38: *Color Photography*. According to Mr. Shepherd, the new process will not follow the usual lines of superimposing colored films, the colored image consisting simply of layers of pigment similar to a water-color drawing. The process is simple in operation and inexpensive, the cost of a dozen quarter plate prints being given as eighteen pence (36 cents). The method can be worked at night, even as far as the printing is concerned, and the color prints are permanent.

This looks like the realization of all our dreams of color photography. We will see that our readers are kept informed of the development of the process, which is promised to be ready for demonstration within a few weeks.



The Traill Taylor Memorial lecture this year, to be delivered at the rooms of the Royal Photographic Society, London, December 11, by Mr. H. H. Turner, F. R. S., will have for its subject "The Great Photographic Star Map."



In response to vigorous protest against the closing of the Quarter Century Photographic Competition announced by the Bausch & Lomb Optical Company, Rochester, N. Y., to close on January 1, the date of closing the competition has been extended until October 1, 1903. The awards in this competition amount to \$3,000. Those of our readers who have thought of preparing exhibits, but found the time too short, will

doubtless be glad to hear and take advantage of the extension of time. A booklet giving the conditions and rules of the competition can be had on request from the Bausch & Lomb Optical Company.

Genre Photography.—"Pictorial photography," says the editor of *The Photographic Chronicle*, "is slowly but surely being freed from the depressing influences which have for some years thrown a gloom over the productions of its followers. The eccentric and advanced pictorialists who can see nothing in nature or humanity except through smoked glasses, have had their day, and must now give place to others who can see the sunshine and light of nature, and the cheerfulness and optimism of man. Pessimism in pictorial photography has been proved a dismal failure; it pleased a few while it lasted, yet it did not, nor will it ever, please the many. Mr. Smedley Aston has already foreseen the doom of impressionism, and as iconoclast has smashed it on its purely intellectual side: the idol thus seen to be mortal, and its divinity destroyed, the ground is cleared for erecting a truer and nobler creed. The first whisper of such a creed is heard in Mr. John Bartlett's recently published monograph on *Genre Photography*, THE PHOTO-MINIATURE No. 42; and this whisper, once heard, will be passed on and grow into a sound of mighty volume. In this rather slight work we do not enter on any new or unknown land, but retrace our steps back to the past, into the healthy atmosphere that surrounds Rembrandt, Teniers, Gainsborough, Reynolds and Wilkie, an atmosphere that may also be detected in the works of Robinson and Rejlander. It is the only art of abiding interest, and even when painted with the coarseness of Hogarth, still holds the imagination of men."

Professor Ogden Nicholas Rood, for thirty-eight years head of the department of physics in Columbia University, died November 14, at his home in New York city. Mr. Rood graduated from Princeton Uni-

versity in 1852 and, after studying at Munich and Berlin for some years, was called to Columbia. Through his extensive research and experimental work he came to be known as "The Father of American Experimental Physics." He was a prolific author on scientific subjects, his "Modern Chromatics" being considered to be one of the best of the many text-books on color.



Dr. Hugo Schroeder, the well-known expert in photographic optics, died at Balham, England, October 31, in his 68th year. During the sixties Dr. Schroeder acquired an international reputation as a constructor of telescopes and high class scientific instruments. In 1897 he went to London as mathematician and scientific advisor for Ross Ltd., his invention of the Ross Concentric lens in 1888 being the forerunner of all other anastigmatic lenses. In 1894 Dr. Schroeder came to America to organize the optical department of the Manhattan Lens Company, but he returned to England a year later and engaged in general experimental work.



Mr. R. Child Bayley, editor of *Photography*, an English photographic weekly, paid a flying visit to America during November. During his stay in New York Mr. Bayley met many American photographic pressmen at an informal dinner given in his honor, and a most enjoyable evening was devoted to gossip concerning things photographic.



The use of aluminum in camera construction and the mounting of photographic objectives is not as new as is commonly supposed. According to a note in the *British Journal of Photography*, the metal was employed for both purposes almost half a century ago. Despite the fact that the commercial production of aluminum was only demonstrated half a century since (by Deville, a French chemist, in 1855), it is claimed that a metal which, from the description of its properties, can

scarcely have been anything else, was discovered in the reign of the Emperor Tiberius, 41 B.C. to 37 A.D. According to a writer in the *Globe*, London, 1898, Pliny tells us that in that reign "A worker in metals presented a beautiful metal cup resembling silver, but lighter, to the Emperor, who questioned him, and learned that he had extracted the new metal from clay. The secret, he said, was known but to himself and the gods. The sage Tiberius, reflecting that if this metal could be made from earth it would lower the price of silver and gold, decapitated the artificer in order that his secret might remain with the gods, and so deprived the world of a most useful benefactor." A recent writer in the *Chemical News* wishes to be provided with name and page of the edition of Pliny's work referred to, and he goes on to say that for four reasons the white metal could have been none other than aluminium, for "(1) it was obtained from clay, (2) it resembled silver, (3) it was lighter than silver, and (4) it was capable of being wrought into a vessel." The reference desired has not yet appeared, so that we are unable to state whether the extract from Pliny is fact or fiction.



The subjoined note from the *British Journal of Photography* is of special interest to those who find objection to the use of present-day alkalies in development. Of late years we have had several salts suggested as suitable substitutes for the alkalies in developers. Of these, possibly, lithium hydrate, sodium tribasic phosphate, and acetone are the only ones which have been practically used. Lumière and Seyewitz suggested trimethylamine, which was certainly the most promising had it not been for its awful stench, which made even the most luxuriously appointed dark-room a room of horrors. Now the well-known color manufacturers, formerly Meister, Lucius and Brüning, of Höchst a. Main, have patented the use of amidoacetate of soda. At a recent meeting of the Verein zur Pflege der Photographie at Frankfort, Dr. König described the use of this salt, and we gather that it is cheap, keeps well, and is without smell, and does not attack the skin

nor the gelatine of the film, and further, with pyro gives a developer of extraordinary rapidity and density, giving power with a good black image and absolute freedom from fog. Dr. König says: "It was not our endeavor to increase the number of commercial developers. We consider it far more important that we have succeeded in discovering a substance which can not only replace the alkalies with all organic developers, but which can increase the reducing power of most of the developing agents to such a degree that developers of quite new qualities are the result." Probably this new preparation will shortly be placed on the market, and we shall be able to practically try it. We note that the above-mentioned firm has introduced a pyro developer, under the name of "Pinakol P," which contains pyro, amidoacetate of soda, and sulphite in suitable proportions.



In response to several inquiries as to where Japanese and other imported papers can be obtained for photographic purposes, we are informed that a fairly large assortment of these is carried by the Japan Paper Company, 36 East 21st St., New York. We have looked over the sample books of this company and have pleasure in mentioning their facilities in the interests of our readers. A word to the company, mentioning this magazine, will doubtless bring any further information that may be desired.



The International Exhibition at Turin. It will be remembered that, in response to a special invitation, Mr. Alfred Stieglitz, representing American pictorial photography, sent to this exhibition a collection of photographs showing the present condition of pictorial photography in America. The display comprised sixty prints, the work of thirty-one exhibitors. We are pleased to hear that the collection has been awarded several medals at the exhibition and that the King's Prize, which we believe was the highest honor offered, has been awarded to Mr. Alfred Stieglitz. This information comes from General di Cesnola, the managing

director of the Metropolitan Museum of Art, New York, who writes to Mr. Stieglitz as follows :

"I am glad that what you did for artistic photography has once more been recognized. This may interest you, hence my sending you the information (*in re* the King's Prize), especially as the Metropolitan Museum of Art requests me to do so."



The Voigtlaender & Son Optical Company, 133 W. 23d St., New York, sends us a copy of its new catalogue of lenses, containing much interesting information concerning the new introductions for this season. Among these we note that the Collinear, Series II, is now listed with a special "focusing jacket" mounting, for use in fixed-focus cameras or cameras having focal plane shutters. Announcement is also made of a new lens called the Apochromat for process reproduction work. This is specially corrected for color, and has other important advantages which workers in photo-mechanical methods will not be slow to appreciate. A series of prisms for use with the Apochromat is also listed in detail. We are informed that this company will hereafter furnish the well-known Euryscope lenses, formerly handled by a Boston firm. Series III of this lens is listed in the new catalogue. This series has for many years been considered the most popular portrait lens among American photographers.

The catalogue is unusually complete in its display of the great variety of specialties made by Voigtlaender & Son, and is handsomely illustrated. Readers can obtain a copy on application to the publishers.



"The proof of the pudding is in the eating thereof"—according to the old proverb. Mr. Edward W. Newcomb, 888 Bible House, New York, would fain have the readers of THE PHOTO-MINIATURE know the helpfulness of his several specialties for photographers by actual test. To this end he offers to send a sample box of his various preparations for the nominal sum of 50 cents. We have experienced the pleasures

of this sample package and can endorse it as well worth the money. Mr. Newcomb advises also that he has undertaken the selling agency for "Boslay," an automatic developing and fixing solution for plates, films and papers. A liberal sample of this product can be had for 15 cents.



Mr. James H. McCorkle, whose formulæ for obtaining various colors in platinotype prints gave so much interest to THE PHOTO-MINIATURE No. 40: *Platinotype Modifications*, has devoted further investigation to the possibilities in this direction and we have secured the new formulæ, with instructions for their use. These will be given in our next issue and should not be overlooked. Speaking of his experiences, Mr. McCorkle says that a platinotype print which has been toned with uranium and afterwards brought back to its original black and white, is intensified by these changes. This would seem to show that while the oxalate will remove the color tone obtained in platinum prints by means of uranium, it does not alter the intensification of the print.



The many friends of Mr. E. L. Somerville, manager of the New York depot of the Cramer Dry Plate Company, will doubtless be interested to hear that he has given hostages to fortune by his marriage, October 14, to Miss Louise Van Sinderen, of Nashville, Tenn. The happy couple are by this time in the throes of home-making in New York city, in which adventure we are sure our readers will join with us in wishing them every possible success and happiness.



A pocket list of some six hundred views of Philippine scenes, etc., comes to us from Squires & Bingham, of Manila, P. I. These views cover many subjects of interest in our new possessions, from Filipino girls to a house-moving scene in Cebu. The views are obtainable in 4 x 5 prints at \$1.25 per dozen, or 5 x 7 prints at \$1.80 per dozen.

The continuous and increasing good will shown to THE PHOTO-MINIATURE by our contemporaries in all parts of the world is a constant source of pleasure and encouragement in our work. Thus, the editor of *Apollo*, a lively little magazine published in Dresden, briefly notices some eight copies of THE PHOTO-MINIATURE in his journal, and says: "As seen by the titles, the subjects of THE PHOTO-MINIATURE monographs are always timely and useful. Each subject being treated completely in its own number, the various monographs form valuable additions to the literature of photography. We again most earnestly endorse this excellent publication."



As our readers doubtless know, the only photographic salon to be held in this country this year is the Third Chicago Salon, which will open at the Art Institute, Chicago, December 16. Mr. E. W. Thomas, the secretary, writes: "The prospects are that the Salon will be very successful this year, both in number of exhibits and quality of work. We have received inquiries for our announcement from nearly every country on the face of the globe." We understand that our Chicago friends, with a view to perpetuating the good work inaugurated in their annual exhibition, are proposing to form an endowment fund which will provide for its continuance in future years.



The exhibition of pictorial photography known as the London Photographic Salon, the tenth annual show of its kind organized by the "Linked Ring," has just closed. It was spoken of by the press as easily ahead of its predecessors. American pictorial photography was largely in evidence at the Salon, including the work of Gertrude Käsebier, Clarence H. White, Alfred Stieglitz, Mrs. Eva Watson Schütze, Edmund Stirling, Eduard J. Steichen, C. Yarnall Abbott, Mrs. J. E. Bennett, Miss Ben Yusuf, J. G. Bullock, Mrs. E. P. Cabot, A. L. Coburn, Miss M. Devens, W. B. Dyer, R. Eickemeyer, Jr., J. Mitchell Elliot, H. G. French,

S. S. Horner, M. Janviér, Joseph T. Keiley, F. K. Lawrence, F. W. Lee, Miss A. Pilsbury, Mrs. W. E. Russell, Mrs. Sarah C. Sears, Mrs. Mary R. Stanbery, A. H. Stoiber, Miss Mathilde Weil, Mrs. Myra C. Wiggins, S. L. Willard and F. Holland Day. The work of Mrs. Käsebier and that of Mr. Steichen received special praise, although the American exhibits, taken as a whole, were favorably received by the critics.



The Ideal Ray Filter Competition inaugurated by Burke & James, of Chicago, which closed October 1, is reported to have been remarkably successful in the number and quality of the competing prints. The judges were Mr. F. Dundas Todd and Mr. R. James Wallace, and they announce the following awards:

Class 1. Landscape, with cloud effects. First prize—One 4 x 5 Century Grand Camera—awarded to M. W. Law, Los Angeles, Cal. Second prize—No. 1 Ideal Magic Lantern—awarded to Robert D. Stevens, Hartford, Conn. Third prize—One 4 x 5 Wide-Angle Lens and Cell—awarded to Clayton W. Maag, 539 Normal Parkway, Chicago, Ill. Fourth prize—One 6 x 8 Globe Background—awarded to Adolph Ditner, Ft. Dodge, Ia. Fifth prize—Ideal, Jr., Photo Optical Outfit—awarded to Gus Horlin, 5127 Wentworth Ave., Chicago, Ill. Sixth to tenth prizes—Each \$1.50 worth of photographic goods—awarded to John Von Bermith, Alamosa, Colo.; S. W. Martin, 282 Laval Ave., Montreal, P. Q.; Z. M. Barnes, Little Falls, Minn.; W. C. Webster, Jaquin, N. Y.; William C. Meyer, Ardsley-on-Hudson, N. Y.

Class 2. Flowers, duplicate prints. First prize—One 4 x 5 Ideal, Sr., Camera—awarded to George C. McLean, Carpenteria, Cal. Second prize—Ideal Photo Optical Outfit—awarded to Charles S. Springman, 165 Eliot St., Detroit, Mich. Third prize—Ingento Ruby Lamp—awarded to Robert E. Weeks, 545 Lunt Ave., Rogers Park, Ill. Fourth to sixth prizes—Each \$1.50 worth of photographic goods—awarded to C. H. Gardner, U. S. Marine Hospital,

Port Townsend, Wash.; Francisco Azoarate, Cuernavaca, Mex.; John H. Wilson, Sykesville, Md.; E. F. Findlay, 1206 Ash St., Macon, Ga.

We regret that the arrangement of THE PHOTO-MINIATURE pages does not permit us to show our readers the prize-winning prints.



At the International Exhibition for Photography and Allied Industries, Amsterdam, August and September, 1902, the well-known photographic "Agfa" products of the Actien-Gesellschaft fur Anilin Fabrikation, Berlin, viz.: Agfa Dry plates, Agfa Flat Films, Agfa Rollable Films, Agfa Developers, Agfa Specialties, etc., received the Diploma of Honor, being the highest distinction awarded in their class.



According to a report in the St. Louis *Globe Democrat*, the M. A. Seed Dry Plate Company has been purchased by the Eastman Kodak Company, of Rochester. We quote from this report particulars given by Mr. Huiskamp, one of the officers of the old Seed D. P. Company.

"It was a complete sale of all the stock, and not merely control," said Mr. Huiskamp, "and it takes in all of our property, including the plant at Woodland, Mo., which consists of a group of fourteen buildings, and the general offices, salesrooms and storehouses at 2005 Locust street. While all of us have sold out, several will remain in the new board of the reorganized company and the business will be conducted and managed the same as before, with no change in the name of the company. The old board was composed of: H. J. Huiskamp, H. C. Huiskamp, M. A. Seed, J. B. Buss and H. C. Reiner. Mr. Seed manages the factory, and Mr. Reiner the city offices, credits, distribution of the product, etc. C. S. Abbott is president of the new company; M. A. Seed, vice-president; H. C. Reiner, secretary, and myself treasurer. On the new board are three eastern men,—Messrs. George Eastman, C. S. Abbott and Walter Hubbel,—and M. A.

Seed and myself, of St. Louis. None of the eastern men will come here, but the home members of the board and the local officers will manage the business."

The M. A. Seed Dry Plate Company was incorporated in 1883 and was the outgrowth of a business started on a small scale by Mr. Seed and a few associates, including the Huiskamp brothers. H. J. Huiskamp, who was president of the company, resided in California for some time, and his brother, H. C., Mr. Seed and Mr. Reiner have been the active managers of the immense business. The plant at Woodland is said to be a model one, with every improved appliance and the most thorough equipment for the manufacture of the product of the company. The original capitalization of the company was \$100,000. A million dollars is spoken of as the purchase price paid by the Eastman Company, but on this point Mr. Huiskamp merely said: "I am not at liberty to state at what figure we sold." The men who have built up the business and enjoyed its profits and benefits all these years now become salaried officials and employes of the new company. H. J. Huiskamp, J. B. Buss and H. C. Reiner of the old board retire from the directorate, and H. C. Huiskamp and Mr. Seed are the only members of the old board remaining on the new one. The new arrangement became effective at once, and the concern is now being operated under the Eastman Company's jurisdiction.



A circular letter issued by Taylor, Taylor and Hobson, Ltd., St. James Building, New York, gives eight plain reasons why Cooke lenses, according to their manufacturers, are better than other anastigmats. Intending lens purchasers should see this circular and, at the same time, ask for the 1A Booklet, which gives complete information concerning the Cooke lenses for different purposes.



An article on "The Use of the Wynne Meter," by Henry Wenzel, Jr. (The Infallible Exposure Meter Company, 237 B. So. 4th street, Brooklyn, N. Y.),

unfortunately too long for insertion here, urges the advisability of carefully reading the Instruction Book sent out with the meter. This advantage should be self-evident, but Mr. Wenzel says that it is often overlooked.

Mr. Wenzel's offer in a former number of this magazine, to put any old-style Wynne meter in perfect order, fitting it with a new dial, glass, etc., and returning it with the latest plate speed-card and instruction book—for the nominal sum of 50 cents—has been largely taken up. Readers of THE PHOTO-MINIATURE who have an old-style meter should embrace this offer at the earliest opportunity. It is necessary to mention this magazine, as the offer is made specially to our readers.



Since the introduction of aluminum film sheaths for cut films, Mr. Carbutt writes that the popular use of his celluloid films in cut sizes has largely increased. With these convenient sheaths films can be used in any modern plate-holder, with all the advantages of plates and films combined. Carbutt Dry Plate and Film Company, Wayne Junction, Philadelphia, Pa.



The wide-spread sale of the new Rochester Dry Plate, made by the Rochester Optical Company, Rochester, N. Y., has been one of the features of the photographic season. As a general proposition, the introduction of a new plate is an expensive and tedious business for its manufacturers. The instantaneous success of the Rochester plate is good proof of its quality. A descriptive booklet can be had from the manufacturers.



The new issue of the *Photo Ticker*, issued by W. P. Buchanan, Philadelphia, for free distribution, is a special background number, and displays the new Mascotte Background Etchings. These are decidedly novel and effective. The Mascotte Dollar series of head grounds is another excellent line, well adapted for home portrai-

ture. Mr. Buchanan also announces the Maignen filter for home or work-room use. This has so many good points that those interested should get the *Ticker* and investigate the announcement for themselves. A twelve-page descriptive booklet of the filter is sent to all who ask for it.

Books and Prints

THE LENS: A Practical Guide to the Choice, Use, and Testing of Photographic Objectives. By Thomas Bolas and George E. Brown. 176 pages; profusely illustrated; index; $5\frac{1}{2} \times 8\frac{1}{2}$; cloth, \$1.25, *net*. [Tenant & Ward, New York.]

This book, which is, modeled on Dr. Miethe's admirable "Photographische Optik," as far as its make-up is concerned, has a twofold purpose. It aims to explain the properties of the photographic lens without the aid of mathematical formulæ, and to give practical instruction in the proper choice and use of lenses for different purposes. The number of books dealing with lenses has rapidly increased of late years, but a careful reading of this latest handbook convinces us that it is the most useful guide of its class at present available. It is encyclopædic in its treatment and completeness of information, and answers more lens questions than any other single volume within our acquaintance. In the matter of illustration the volume is equally satisfactory, and it has a capital index.



THE A B C OF PHOTOGRAPHY. By an amateur (Fayette J. Clute). 85 pages; no illustrations; 5×7 ; paper covers, 25 cents. [Camera Craft Publishing Company, San Francisco.]

Mr. Clute's name has become a household word among American amateurs. For years he has devoted his leisure time to answering their questions and giving practical advice in many photographic journals. In this little book, aptly titled an A B C, he gathers together

much useful information covering the every-day work of the amateur photographer. This information is given in plain language and without waste of words. We commend the book as a thoroughly satisfactory guide to the beginner in photography.

PHOTO-ENGRAVING: A Manual of Practical Instructions for Producing Photo-engraved Plates in Relief-line and Half-tone. By H. Jenkins. With supplementary chapters on the Theory and Practice of Half-tone Color Work, by Frederic E. Ives and Stephen H. Horgan. Second Edition. 169 pages; illustrated; 5½ x 8; cloth, \$2, *net*. [Inland Printer Company, Chicago.]

The manual of "Photo-Engraving," by Jenkins, published some years ago, quickly established its reputation among process workers as a practical guide to process reproduction and, as such, enjoyed a large sale. In this second edition Mr. Jenkins has thoroughly revised his information, adding new formulæ and more complete descriptions of the processes involved. The methods given are those in actual commercial use to-day, a fact which places the volume ahead of all others in its field. The new chapters on the theory and practice of three-color engraving are written by men fully competent to deal with this difficult branch of process work, and further enhance the value of the book.

We are informed that the 1902 edition of Lloyd's "Photographic Encyclopedia" is almost exhausted. There may be readers who have not yet secured a copy of this valuable year book; if so, they should send for it without delay to avoid disappointment. It can be had by sending the cost of postage only to Andrew J. Lloyd & Co., 323 Washington street, Boston, Mass., and is too big a bargain to miss on these generous terms. As a general reference book of photography "Lloyd's Encyclopedia" is worth more than some other reference books offered to photographers at more than ten times its price. The few copies remaining will be sent out in order according to priority of application.

Camera Notes: Vol. VI. No. 2, the first number published under the new management, and edited by Juan C. Abel, made its appearance some weeks ago. In spite of the great difficulties involved in an attempt to broaden the scope and interest of the journal and, at the same time sustain the high standards of quality set by his predecessor, Mr. Alfred Stieglitz, Mr. Abel has produced a magazine wonderfully varied in its interest and most attractive from the pictorial standpoint. Typographically the magazine is distinctly improved, and altogether Mr. Abel deserves congratulation on his success in an unenviable task. \$3 per year. Single copies \$1.



Readers of German will doubtless be interested in the following photographic handbooks recently received from the publishing house of Wilhelm Knapp, Halle, a/s, Germany.

THE BASIS OF PHOTOGRAPHY WITH EMULSIONS (*Die Grundlage der Photographie mit Gelatine-Emulsionen*). By Dr. J. M. Eder. This is stated to be the fifth enlarged and revised edition of Dr. Eder's work on emulsions, but we are more familiar with it as the first half of a new edition of Eder's *Handbook of Emulsion Photography*, of which Mr. E. J. Wall published an English translation in the *Amateur Photographer* about ten years ago. Dr. Eder is well known as the principal authority on this subject. In the volume here noticed he deals only with the historical and theoretical part of emulsion photography, including his valuable monograph on the sensitometry of photographic plates. A second part, dealing with emulsion-making from a practical point of view, will be published later. When completed the work undoubtedly will be for some years the most comprehensive source of information on the subject of emulsion photography. An English translation of the book would be widely useful.

ENLARGING ON PAPER AND PLATES (*Die Kunst des Vergrösserns auf Papieren und Platten*). By Dr. F. Stolze. In this second edition of his manual of enlarging, Dr. Stolze enters more completely into the diffi-

culties of his subject than in the earlier edition. The details of illumination, apparatus, alternative processes, negatives suitable and otherwise, with the optical questions involved, are treated in a thoroughly practical way, and the volume forms a complete and trustworthy guide to enlarging. Almost a hundred diagrams are inserted in the text and offer material aid to its perfect understanding.

SCIENTIFIC ASPECTS OF PHOTOGRAPHIC PROBLEMS (*Wissenschaftliche Arbeiten auf dem Gebiete der Photographie*). By Dr. Luppo Cramer. We have in this volume a valuable contribution to the literature of photographic research, written by one well fitted to deal with his subject from a strictly scientific standpoint. The various papers on the latent image, optical sensitizers, problems in interference heliochromy, etc., published in the European journals during the past year or so, are here revised, added to and presented in convenient form for reading and reference.

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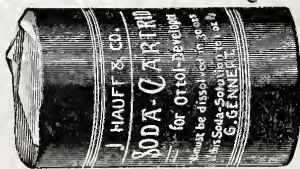
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A FEW SAMPLE OPINIONS OF THE KODAK DEVELOPING MACHINE

There is already a large number of the Kodak Developing Machines in the hands of kodakers—and they work. Letters are received every day from dealers who tell us of their customers' enthusiasm—tell us of how amateurs are getting better results than they had ever been able to obtain by the old methods. Perhaps none has been more enthusiastic than Mr. F. P. Streeper, of Philadelphia, who writes: "I have developed many hundreds of films and by many methods, but can say that the first roll of film which I developed in the machine produced as good if not better negatives than I have ever been able to obtain by hand. The developing powders as put up by your house produce a developing solution which most certainly brings out all that will possibly come, and produces excellent printing negatives."

Arthur N. Marshall, of Westport, N. Y., writes: "I have already tested it on two films with excellent results. I verily believe it will be a God-send to amateurs, also to professionals who consider their time of any value."

Havers & Fagan, New York City: "We consider it a wonderful invention, which in time will revolutionize film photography for the amateur."

N. F. Sleeper, Laconia, N. H.: "I had a friend take up the two rolls of film (6 exposures) and I developed them with the machine as instructed. I got twelve finely developed negatives. Allow me to say that I think the machine a great improvement over the dark-room and ill-smelling dark-room lamp."

P. J. Scherer, Sidney, O.: "I have used your Kodak Developing Machine with results far beyond my expectation,—better and cleaner negatives than I have been able to get by the old method."

Harry C. Sayler, Reading, Pa.: "I developed thirty rolls 12-exposure No. 2 Bull's-Eye Films with the most satisfactory results I have ever obtained."

Robert R. Ellis, West Point, Miss.: "Our man in charge of the Kodak line says that 'tis almost human, and it far surpasses his expecta-

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tions, not only doing away with the dark-room, but producing a far superior grade of work than the amateur can do, and equals an expert."

J. Bourgholzer, Washington, Ind.: "I gave an amateur one of the films you sent with the machine and he exposed them and developed them, and he says he never did do such nice developing."

R. M. Barr & Son, Waterville, N. Y.: "Is as great an advance in photography as the invention of the daylight loading cartridge."

W. J. Graff & Co., Spring Green, Wis.: "The machine is a jewel and it works to the queen's taste. It is the greatest invention in the line of kodaking the world has ever seen."

C. H. Davis, Philipsburg, Pa.: "Am delighted with the machine. I want you to book my order for the next size larger as soon as it is out."

E. W. Bruffey, University of Va.: "I developed 24 exposures and every one good. I had given up taking pictures almost entirely on account of the dark-room, but as this machine does away with that, I will now revive a pleasure that I enjoy most."

L. G. Hamilton, Fremont, O.: "It works fine. Had on the same film roll one four-minute exposure and some snap shots, and they all developed fine."

S. Graff Haverstick, Frostburg, Md.: "The greatest invention for the amateur since the invention of the cartridge film. Now any amateur 'can do the rest.'"

WHAT EDITOR TODD SAW

At the Buffalo convention we saw the Kodak Developing Machine in operation, and it worked exactly as scheduled. It has a funny side, too, for at one blow it annihilates by practical demonstration the lingering fragments of the delusion that it is essential to be eternally tinkering with the developer so as to suit the exposure. On the same roll were exposures on the same subject with great variety in the time given, and yet all of them showed far better results than the average man could get by tinkering. Did it do nothing else but drive the last nail in the coffin of this long-lived fallacy, it would be a great machine, but it has even a better claim, for it does all that is claimed for it, and that is a great deal.—*Photo Beacon*.

EDITOR NEWCOMB'S PROGRESSIVE VIEW

In our advertising pages will be found an announcement of the greatest possible interest to all who photograph. It has come to pass that we not only load our cameras wherever we are, without entering a

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hot, stuffy dark-room, print our pictures and develop them in the same room with the family, but now we actually develop and fix our exposures in the largest, airiest room in the house, by any light (or the warmest and snuggest) without fear of spoiling the sensitive film. No more ruby lights, no more sweltering in closets or ill-ventilated rooms, no more covering up of tiny cracks or plugging up of keyholes. No more mistakes on account of dim light or failures through hurrying in order to get out of a disagreeable, air-tight, lightless, kerosene-smelling make-shift of a dark-room. The chain is now complete for the fortunate possessor of a Kodak; for after making the day's exposures, he has simply to sit down wherever he may be—at home with his family or friends gathered about him, in his room at the hotel, if touring, or right on the spot, if a newspaper reporter—and attach his daylight cartridges to the new machine, turn the crank five minutes, pour off the developer, pour in hypo, turn another five minutes, and lo! he has a clean roll of negatives all ready to wash and dry. Better still, the quality, even when incorrect exposures have been made among correct ones, seems to be of a far higher average than has been attained by the best and most careful workers by the old method. We know that the ability of this mere machine to produce better work than careful hand work will be doubted. We doubted it ourselves, and since the never-to-be-forgotten day we were awed by the appearance of a perfect negative resulting from a drop shutter exposure of about 1-10 second some twenty-five years ago, we have never been so strongly impressed with anything in photography. After all, the fact that the work is machine or automatic should be a guarantee that it is regular, effective and more perfect and uniform than it could possibly be by hand. The modern watch is a better watch than the old-time ones, because all its machine-made parts are true and uniform. Iron buildings are riveted together nowadays by pneumatic machines, painted with them, and stone buildings are carved by machines. Ten thousand finely printed newspapers in six colors now pour out of four-story presses in the same time it took Mr. B. Franklin to pull one copy of his paper years ago, and so on; we could fill page upon page in proof of the fact that we look to machinery to-day for speedy, reliable and most perfect work. Let none attempt to pooh-pooh the developing by machine idea, for an hour's experience with it will make him wish he could unsay all that he has said. We have seen it do splendid work on varied exposures, and we know that it is destined to become indispensable. Everything connected with the Kodak is now so simplified that it can be done better than ever, easier than ever, and with absolute pleasure and comfort. But one thing remains wanting, and patent has been applied for that, and it will, we presume, soon be on the market. The missing link is an expansion reel to hold all sizes of film, from little Pocket Kodak up to 5 x 7, while washing and drying in order to retain the perfect, spotless, scratchless film as it finally rolls out of the developing machine.

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It strikes us that this developing machine has added several hundred per cent to the value of the Kodak as an ideal camera, making it peerless and of the most inconceivable value to those who photograph. Verily, the kodaker has now reached full happiness, or will have when he has purchased this machine.—*Photo-American*.

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* * * —FRANÇOIS VOITIER, in *Field and Stream*.

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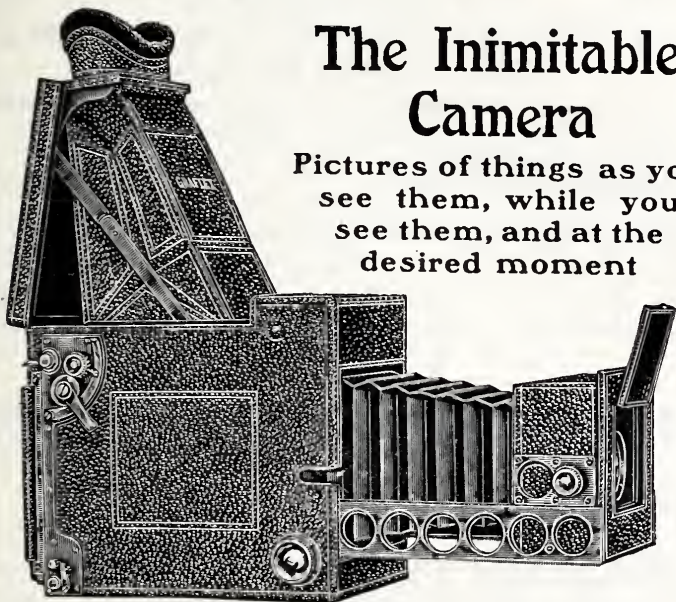
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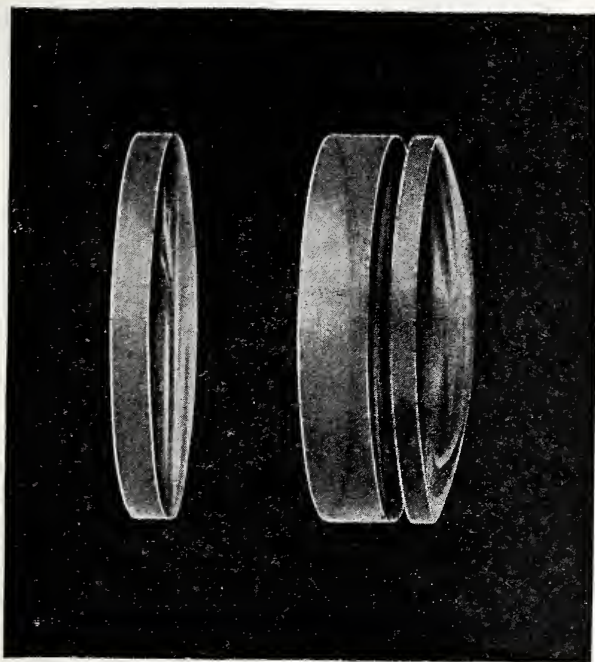
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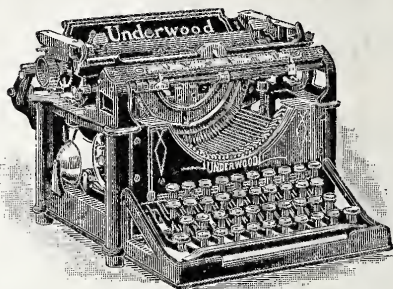
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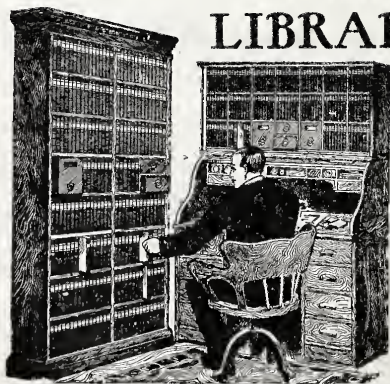


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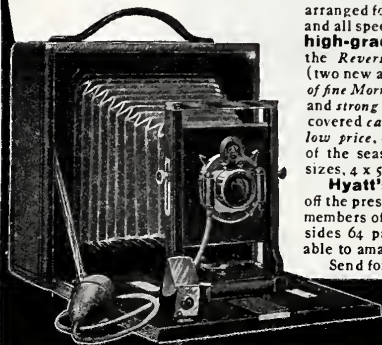
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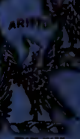
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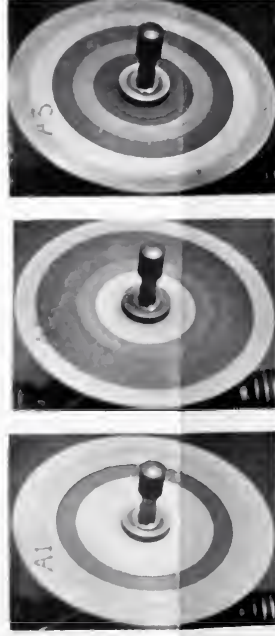
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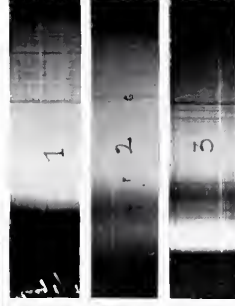
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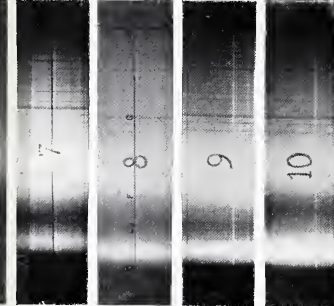
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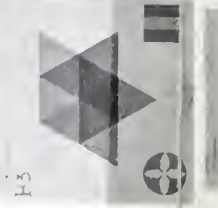
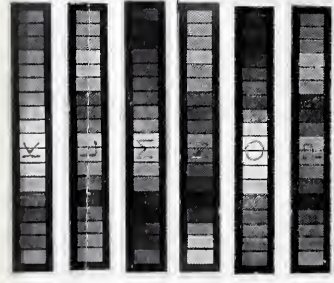
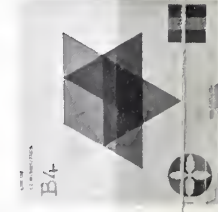
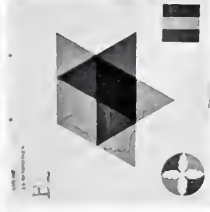
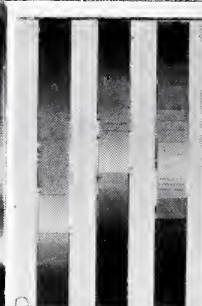
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 B. Seed L. Ortho, with Chromatic Curve Corrector
 C. Cramer Inst. Iso, with Isochrom screen
 D. Cramer Med. Iso, with Isochrom screen



- E. Polychromatic, with Carbutt adjusted screen
 F. Seed 26 X, no screen
 G. Cadett Spectrum Plate, Absolutus screen
 K. Cramer Inst. Iso, with Isochrom filter
 L. Cramer Inst. Iso plate, without screen
 M. Seed L. Ortho plate, with Curve Corrector
 N. Seed L. Ortho, no screen
 O. Cramer Med. Iso, with Isochrom filter
 P. Cramer Med. Iso, no screen



- B1. Cadett Spectrum plate, Absolutus screen
 B2. Cramer Med. Iso, with Isochrom filter
 B3. Seed L. Ortho, with Curve Corrector
 B4. Cramer Inst. Iso, Isochrom filter
 B5. Carbutt Polychromatic, with adjusted screen



NOTE.—In the series K to P the colors range from Magenta Red at the left, through the spectrum to Dark Violet at extreme right.

The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT

Volume IV

DECEMBER, 1902

Number 45

MORE ABOUT ORTHOCHROMATIC PHOTOGRAPHY

Three years or more have passed since there was published, in this series, a little book dealing with orthochromatic photography, its meaning and purpose. The monograph was confessedly an elementary introduction to a big and important subject,—simply an outline of the interesting problems involved in the faithful representation, in monochrome, of any object or scene possessing the charm of color. The appearance of the book was timely. It met a definite need and was generously appreciated, passing through several large editions. I am glad to believe that it has proved useful to many workers in photography. Since September, 1899, however, many things have happened in photography. The subject of orthochromatism, in particular, has attracted widespread attention. Amateurs have experimented with orthochromatic plates; professional photographers, always conservative, have tested them and acknowledged their practical advantages; plate-makers here and in Europe have spared neither labor nor expense to improve existing orthochromatic plates, or to introduce new and better varieties.

One result of all this educational activity is a call for more information concerning orthochromatism, especially, for the "bottom facts" which will enable the photographer to understand and meet difficulties which are not satisfactorily solved by the commercial products ready to his hand. Here, briefly, we have the scope and purpose of this monograph. Presuming the reader

to know those things set forth in *THE PHOTO-MINIATURE No. 6: Orthochromatic Photography*, the information herein given is intended to supplement the earlier monograph—not to take its place. For those who know little or nothing of orthochromatic photography *THE PHOTO-MINIATURE No. 6* is as useful, nay, as indispensable, as ever,—clear in its facts, plain in its explanation of the elements of orthochromatics. The monograph here presented is clearly a second book, leading the reader to a higher and deeper comprehension of the advances made in and by orthochromatic photography. As such it undeniably calls for careful reading. It is the work of Mr. R. James Wallace, an enthusiast whose practical knowledge of the subject is probably surpassed by few workers on this side of the Atlantic. We get an idea of the amount of patient work involved in what follows from the fact, revealed in a letter accompanying the author's manuscript, that the material presented in Plate A was selected from the visual examination and comparison of over eight hundred negatives.

A
Definition It may be that these pages will be read by some who have not seen *THE PHOTO-MINIATURE No. 6*. For their benefit, and to make sure that the reader shall not miss the significance of what Mr. Wallace tells us, I propose to make room here, at the outset, for a couple of paragraphs from the earlier monograph. As popularly understood, orthochromatic photography is a method which gives a more correct rendering of the "color values" of objects that can be had with the ordinary dry plate commonly used in photographic work. The term "color values," however, has misled many into the erroneous belief that it is possible to represent color-contrasts (differences of hue) in objects by differences of tone in the photograph—a manifest absurdity. We begin, therefore, with a better definition, viz., that orthochromatic photography is a method which aims to give us a correct record in monochrome of the relative brightness of objects as seen by the eye, regardless of their color. That we have here a distinction with a vital difference will be apparent as we proceed.

Luminosity—
 the Key

Let us recall a few familiar facts. We know that modern photography is based upon the action of light on the sensitive film of the gelatine-bromide plate—the ordinary dry plate or “film” of the stores. We also know that photography, being a monochromatic method of reproduction, cannot give us a direct record of the colors seen in almost everything we photograph. In looking at anything showing several colors, however, we know that the eye differentiates (separates as different from each other), *first*, the contrasts of color, i. e., the differences of hue, and *second*, the contrasts of light and shade, i. e., the relative brightness (luminosity or light intensity) of objects compared with one another under the existing conditions of illumination, and quite apart from their color. For example, if we look at a scene showing green trees, and a blue sky flecked with white clouds, the eye perceives (1) the differences of hue (contrasts of color) between the green of the trees, the blue of the sky, and the white clouds; and also (2) the relative brightness (contrasts of light and shade) of the white clouds compared with the blue sky, and of the latter compared with the green trees. Now, as it is obviously impossible to render color-contrasts (differences of hue) in monochrome, we have only light and shade left, and it clearly follows that, if the photographic plate is to record what the eye sees, it must correctly represent the contrasts of light and shade (the relative luminosities) of the scene in their proportionate intensities as seen by the eye, no matter what the color may be.

Wherein Ordinary Plates Fail

This, however, photography by the ordinary method cannot do, and its failure to correctly represent the relative luminosity or “eye-value” of objects is its most serious defect. Thus we know that if we photograph, as we sometimes have to do in portraiture, ribbons showing the colors red, yellow and blue, all of *equal brightness* or brilliancy to the eye, our photograph represents the red as darkest, the yellow almost as dark as the red, and the blue much lighter than either the red or the yellow. Or if we photograph violet and bright yellow pansies together, the photograph represents the

yellow pansy as the darker of the two, although to the eye it is much brighter (more luminous) than the one of violet hue. Similarly, if we photograph a scene with a foreground of trees in autumn garb, and a blue sky with clouds, the trees in our photograph usually appear darker than they seemed to the eye, and the sky is often represented by a blank white space. We must be careful to recognize that in these instances the plate has failed to record the *luminous values* of the objects; it has nothing to do with the colors of things, simply because color is a purely physiological effect, peculiar to the eye. Thus, if we photograph colored objects having the same degree of luminosity to the eye, we can only represent these luminosities correctly by equal degrees of opacity in our negative. If we seek to render differences of hue by differences of tone, we will produce a false record where the luminosities are equal; for in such a case the objects have the same intensity to the eye apart from their color, and their difference of hue can only be represented by color or pigment, not in monochrome. Now, if we think for a moment of the important part color luminosities play in all nature and art, we at once realize how grievously defective is the ordinary photographic plate, inasmuch as it not only fails to give us a color-record of what we see, but also to correctly represent the relative luminosity of objects—the gradations of light and shade in colored objects as the eye sees them. This defect is popularly explained by the assertion that the photographic plate is oversensitive to certain colors (violet, indigo, blue), and but feebly sensitive to others (green, yellow, red), so that the first impression the plate before the latter have time to do their work. Here, again, we have confusion of terms which leads to misunderstanding; for, as we will see, the defect of the plate is due to its lack of luminosity sensitiveness, and has nothing to do with color. How the ordinary dry plate was modified, by being bathed in dye solutions known as “color sensitizers,” or by these color sensitizers being incorporated in the emulsion during the manufacture of the plate, so that it was made more equally sensitive to the varying luminosity of different colors, is fully detailed in *THE PHOTO-MINIATURE* No. 6. Let us now put

ourselves into the hands of Mr. Wallace and learn of the most recent advances in orthochromatics.

EDITOR.

**The Fallacy
of the Yellow
Screen**

Until within a few years it was generally considered that although the orthochromatic plate was much more sensitive to color than an ordinary plate, yet that sensitiveness was unequal throughout the color range of the spectrum, and a yellow screen, used in conjunction with the plate, was needed to faithfully represent objects in color with their relatively correct luminosity.

Almost any yellow screen, so long as it was comparatively clean and clear, was considered as being suitable; and although the use of such a filter in the majority of cases improved the result, yet the advance of knowledge by experiment has proven this idea to be misleading and fallacious.

**The
Necessity of
Adjustment**

To be thoroughly useful to the intelligent photographer, the "color screen" or filter employed must be carefully adjusted to the plate used and no other, and it is in this adjustment that the secret of success consists.

It is my purpose to explain as clearly as possible the manner and conditions of this adjustment of plate and screen in its various stages, so that the photographer may be able to construct for himself the necessary apparatus which, simple in itself, yet places in our hands a means of accurately measuring the various results obtainable with different plates and screens. This personal work opens to the mind a never-failing source of profitable instruction, which can only end in the betterment of our every-day results in photography and add to our interest in the development of the art. Furthermore, with the aid of the spectroscope, to be described later, the way is opened into a new world, full of the most glorious surprises.

Light **We have learned from THE PHOTO-MINIATURE, Nos. 6 and 38, that what**

we term *light* is a disturbance of the ether, and that when a beam of light is passed through a

glass prism we obtain a colored spectrum, which is simply an analysis or decomposition of that beam. We have further seen that the spectrum is crossed by a great number of bands bounded by what are known as Fraunhofer lines, and that these lines are immovable in their position, and serve as indicators or markers of the six primary colors composing the spectrum. We also know that there are two regions, one at each end of the visible spectrum, of great activity, termed respectively the infra-red and ultra-violet. Of these only the latter need concern the photographer.

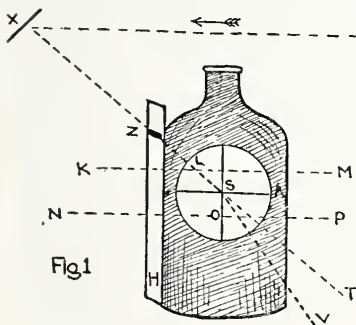
Recapitulating still further the introduction to this subject in the earlier monograph, we learned that *color* is simply a physiological sensation governed by three "constants" termed hue, purity and luminosity, by the use of which terms we are able to definitely specify any particular hue or shade with the utmost precision.

As the analyzer of light is a prism and its analysis the spectrum upon which all true experiments are based, the reader will agree in the belief that this foundation should be made firm, if we desire to build thereon a body of structural deductions.

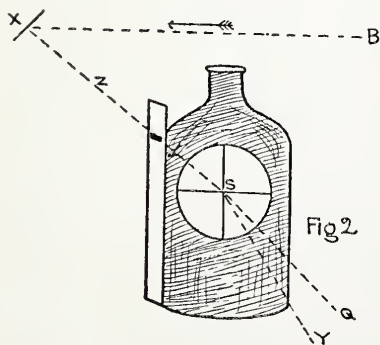
The Prism and Its Work Why and how does a beam of light only a single millimeter wide spread itself out after passing through a prism into the elongated multi-colored band known as the spectrum? What is the action of the prism upon the beam, and why do the bands of color invariably retain their relative places? I have observed that in the beginning this is the first and chief difficulty to the average student in taking up the study of light. Eventually the statement that the prism decomposes the beam of light into its elements is accepted together with the fact, but the understanding of the idea is rarely clear. Let us therefore undertake a little experiment, which can be performed by anyone, simply to elucidate this point.

Barnard's Experiment Procure a common glass bottle with parallel sides, holding about 4 or 8 ounces, and entirely cover one side with a piece of black paper, out of which cut a perfectly circular opening. Next draw across the clear glass thus

exposed two lines with ink, which will divide the circle into four equal parts, as indicated in Fig. 1. Now fill the bottle with clear water up to the horizontal line A and place it on a table, or other suitable stand, so that a small beam of light from a slit in the window curtain, or from a lantern of any kind, strikes upon the side of the bottle (H). To render the path of the beam plainly visible, a small piece of cardboard pierced with a narrow horizontal slit should be placed against the side of



the bottle. Now if the beam be projected so that it passes through the bottle from K to L it will emerge in the same direction as it entered, KLM. Again, if the cardboard slit be placed so that the beam passes through in the direction NO then it will continue straight and emerge in the same line as indicated by the dotted line NOP.



Now place the bottle so that the light beam passes over the top and falls upon the mirror X, from which it is deflected downwards at an angle, passing through the slit Z, and striking the surface of the water in the bottle at S. In-

stead of continuing onward in the same direction to T the beam is now bent out of that line in the direction of V, but is not bent until it strikes the water.

This bending of the ray is called *Refraction* *refraction*, and takes place whenever a beam of light passes from one transparent medium into another of greater density. The angle which the original ray makes with the normal at S is designated the "angle of incidence, and the angle made by the emergent ray (SV) is known as the "angle of refraction." Should the angle of the incident ray be changed (within certain limits) then obviously the angle of the refracted ray will also change in constant ratio.

Let us proceed further with the experiment. Having adjusted the beam of light and the bottle (Fig. 2) so that the ray passes from B along to the mirror X and thence downwards to the slit Z, striking the water at S, place in front of the slit a piece of ruby glass, or gelatine colored deep red, and carefully mark on the bottle the path or direction of the refracted ray as at Q, and then replace the ruby glass with a piece of blue glass. It will now be seen that the angle of the refracted ray has been changed and is further bent or refracted than the other, as at Y. If each particular ray of the spectrum were to be passed through the water thus, we should find that each hue had its own particular angle of refraction, or to speak technically, would differ in its "refrangibility." This, therefore, explains why a narrow ray of light which is composed of different colors is bent and spread out into a spectrum—simply that one color is refracted to a greater extent than another, and in their passage through the prism (a denser body than the air) they have been sorted out, as it were, into their proper directions.

When the beam of light passed through the air space in the bottle, as at KLM, Fig. 1, or through the water, NOP, the ray was not bent, because it fell upon the glass or the water at a direct right angle known as the "normal direction."

Heretofore we have considered the spectrum as being formed by a prism of glass, but there is another method of spreading out a ray of light in the form of a spectrum. In this case we make use of

Prismatic
and Diffraction
Spectra

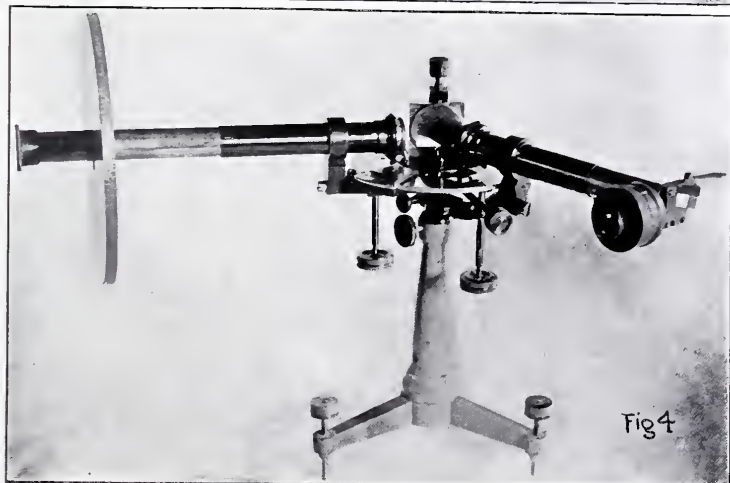
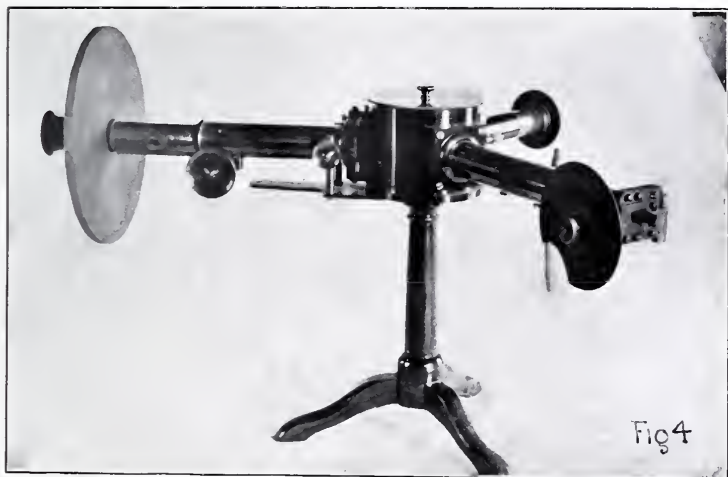


FIG. 4. See page 414.
DIFFERENT FORMS OF COMMERCIAL SPECTROSCOPES



what is known as a diffraction grating, which is a small, polished, metal mirror, across the surface of which has been ruled (with a diamond) a great number of perfectly parallel and equidistant lines. It is called a "grating" because the property it possesses was originally discovered by Fraunhofer, who formed his instrument by a grating of fine wire wound over two fine screws.

The instruments of the present day, however, have advanced wonderfully since that time, and were brought to a high pitch of perfection by the late Professor Rowland, of the Johns Hopkins University, whose rulings of 14,438 and 40,000 lines to the inch it would be difficult to excel.

Diffraction Gratings There are two forms of diffraction gratings, known, respectively, as reflection and transmission gratings, of which the former is ruled on speculum metal, while the latter is on glass. The beam of white light which strikes the grating at an angle is diffracted by the edges of the scratches and reflected off, to spread out in the form of a spectrum. It is not necessary here that we enter into the reason for this phenomenon—sufficient that it exists. As this spectrum has not been formed by a prism, it is not a *prismatic* spectrum, but a *diffraction* spectrum, which is altogether different.

True, it has divided the white light into the same number of colors arranged in the same orderly sequence, but the difference lies in the *relative amount* of each color. In the prismatic spectrum, the red, orange and yellow bands are huddled up together at the one end, while the blue and violet bands are stretched out of all proportion at the other. In the diffraction spectrum the colors are all equally divided throughout the entire length, and that length itself is greater the finer the ruling of the grating; in other words, the dispersion is dependent upon the closeness of the ruling. We may, incidentally, note here that the beautiful iridescent coloring of mother-of-pearl is simply due to the fact that its surface is covered with minute but irregular scratches. Any surface so covered will glisten with the same effect.

The spectrum produced by a diffraction grating is known as a *normal* spectrum, and it is with this instrument that all delicate and definite wave-length measurements are made. In photographic absorption work it is but rarely used, most workers having arrived at their results with a prism. The cost of a good grating is prohibitive to all but the advanced worker. In Fig. 3 is shown the relative spacing of the Fraunhofer lines in both prismatic and normal spectra.

The shortcomings of commercial orthochromatic plates in the correct rendition of color luminosity explain the general use of color screens as supplementing the deficiencies of our plates. The literature of the color screen, as scattered throughout the various

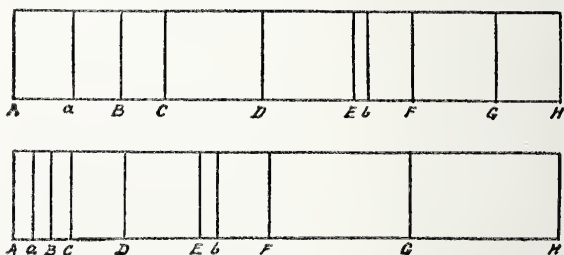


FIG. 3

photographic publications, is singularly prolific, but at the same time singularly erratic. Formula after formula has been published, giving explicit directions for the manufacture of screens of every variety and shade of yellow and orange, but without the slightest suggestion as to what plate that particular screen may be suited. Let me again insist that the screen, to be of greatest usefulness, must be adjusted to the plate used. Select whatever brand of plate you consider best suited to your purpose, and stick to it, adjusting your color screen to its needs. Only by so doing is it possible to attain final excellence of results.

Writing on the ignorance displayed in the selection

of color screens, Cadett says: Light-filters have been used and put on the market for many years, which have been a simple farce so far as correct rendering is concerned. Any piece of yellow glass has been considered good enough by many people, quite oblivious of the fact that *all* luminosities should be correctly rendered. A light-filter, in the orthochromatic sense, is simply a compensator for the imperfection of the plate. Strictly speaking, no light-filter should be required*, but, as we must at present have them, clearly they *must be* adjusted to the particular plate used. This means measurement, either by trial or error, or by strict scientific measurement, and the latter is the only way to place light-filters into the condition of respectable commercial position. Had we called "orthochromatic" photography "correct luminosity" photography, there would have been some general education in the name. However, on the principle of conservatism, good or bad, we must, I fear, keep up our bad habits. I am anxious to induce as many as possible to take up orthochromatic photography as a matter of sentiment as to what is right; and, moreover, the judges of our various exhibitions have to be taught, for they have been judging blue, violet and ultra-violet renderings long enough. They will want educating as well as the rest of photographers.

The exquisite rendering of skies in landscapes, and indeed the whole rendering of the picture by correct luminosities, is such that, excepting for instantaneous work, no photography should be done without plates and filters correctly rendering all luminosities. A few trials on flowers will at once convince the most skeptical.

There is little doubt that the use of orthochromatic plates will enormously increase during the next few years.

In the brief interval which has elapsed since Cadett wrote, the prophesy has borne abundant fruit, for there is hardly a manufacturer of dry plates at the present time who has not either already introduced orthochro-

* It should be pointed out that the Cramer Dry Plate Company emphatically insists that its *Slow Iso* plate needs no color screen or filter, and that the use of a filter with the *Instantaneous Iso*, although common, simply reduces the speed of that brand to that of the *Slow Iso*.—EDITOR.

matic plates, or has them in process of manufacture. This increase of production means better and more thoughtful work, for there can be no doubt whatever concerning the comparative merits of orthochromatic and ordinary plates.

False Standards Speaking of the correct representation of the color luminosities by orthochromatic plates, Cadett says: It is harder to unlearn than to learn. We have by the practice of many, many years, got an idea as to what a properly exposed negative should look like, and the average operator, if you gave him a colored picture to photograph, would, after he has given a certain exposure to his negative, say that it was properly exposed, when, as a matter of fact, does he really know what he is talking about? This means that we have trained ourselves to judge negatives from an entirely false standpoint; we judge them merely from what light is reflected from the objects we photograph, as representing the blue and ultra-violet rays that are given off by the reflected image. How far does this agree with what the eye actually sees? As a matter of fact, very little indeed; our reds may come out blank so long as other objects surrounding the red ones give a certain amount of detail, and the photographer then says that he has a fairly exposed negative.

When the day arrives that a quick plate will be capable of representing color luminosities of objects as we see them in nature, we shall have negatives of a very different character indeed, so much so that the photographer of today would think, if he saw one of those negatives, that something was actually wrong with it. All this, some day, will have to be altered; we shall have to unlearn our present negative-making when we start on the true method. Of course, there are hundreds of photographers who will tell you that plates should be orthochromatic, but they do not realize what this would actually mean if such a desirable state of things could be brought about; certainly, to begin with, 90 per cent of the retoucher's work will not be required. I fear that all we can do now is to sigh with vain desire for some few years to come; never-

theless, the possibility is before us, and it is only right that we should reflect upon the inevitable future. I merely pen these few words to see if I can set some brother photographers in the right line of thought.

We must learn, and that soon, not to be satisfied with anything less than perfect orthochromatism, and when the happy day arrives when such plates can be made of great sensitiveness the photographer will have to accustom himself to judge his negatives from an entirely different standpoint.

Apropos of the different results secured with ordinary and orthochromatic plates, there appeared a series of pictures in the *Amateur Photographer*, of London, in which the superiority of the latter was well shown. These pictures were reprinted in *La Photographie Française* and accompanied an article by the eminent authority Mons. F. Monpillard* who spoke very highly of their value.

Numberless examples could be quoted from the works of nearly all the recognized authorities in photography. It is only the unobservant and uneducated who differ or who remain at this late date still unconvinced.

Of course there will always be a rear rank in photography, just as there is in every trade, profession or branch of science; those who pride themselves upon being "conservative" (never stubborn or uninformed).

The repeated mention of the effect of
 Ultra-Violet ultra-violet light on the photographic plate must have been apparent, even to the casual reader. There is certainly a continuing action in this portion of the spectrum, but that action has been greatly exaggerated. Repeated and extended experiments have been made by many eminent workers in photography and physics, and much has been written thereon. Investigators have fitted up special apparatus equipped with lenses and prisms of quartz, and the utmost care has been taken to reduce to a minimum the absorption of the ultra-violet by any substance through which the beam had to pass. But why should all this care be taken when the photographer, even in the exacting

**La Photographie Française* for April, 1902. M. Monpillard has accomplished considerable in conjunction with M. Clerc in the direction of standardizing color screens whether liquid or pellicular, this work being the result of a proposal brought before the International Photographic Congress.

field of color photography, makes his negative through a glass lens? If the glass absorbs, as is known, a considerable portion of the ultra-violet, why experiment on the selection of any special dye which will absorb the entire ultra-violet spectrum, when three-fourths of it is already absorbed by the glass which forms the image upon the plate?

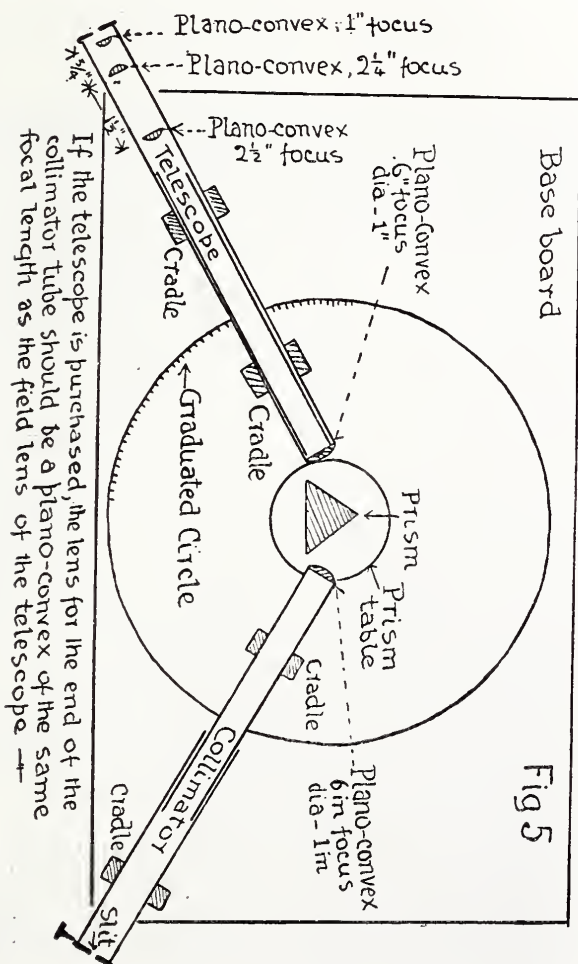
Again, many experimental workers use in their study the spectrum of the electric arc, which is particularly rich in rays of the ultra-violet, and is therefore not suited for work when deductions have to be made applicable to work by daylight.

We have entered very fully* into the advantages of the spectroscope as an adjunct to the study of orthochromatism, but it is not given to everyone to be the happy possessor of such an instrument. The prices are exorbitantly high, and, after all, one can easily construct a satisfactory instrument for oneself. Of course there are some parts which it would be better to purchase, such as the prism and slit—this latter being the principal point in the entire instrument; but these can now be purchased at a nominal expense. I therefore make room for instructions which, if carefully followed out, will result in the possession of an instrument which will a thousand times repay its original cost (about \$5, or £1) and will plainly show the principal Fraunhofer lines in sunlight, the luminous line spectra of the metals, or the absorption spectra of dyes or filters. To the student of color the spectroscope is, indeed, an invaluable aid and never-failing source of information.

In Fig. 4 (half-tone illustration) is shown a photograph of two different forms of the spectroscope. If the reader will carefully observe he will see that although there is a considerable amount of polished brass and other sundries, yet both instruments (and, in fact, all spectroscopes of whatever make or size) are reducible to the one simple principle of a tube with a slit at one end and a lens at the other, a glass prism and a telescope—that is all.

Figs. 5 and 6 explain themselves. The lenses used,

*THE PHOTO-MINIATURE Nos. 6 and 38.



together with their focal lengths, have been carefully figured and drawn for those who care to purchase and make up for themselves. However, I would suggest that the better way is to purchase the various pieces (as before mentioned) and put them together. A telescope of about 12 or 13 inches in length can be purchased for \$2* (8/-) with a magnifying power of about 10 diameters. The slit plate had better be purchased, although it presents no particular difficulty in

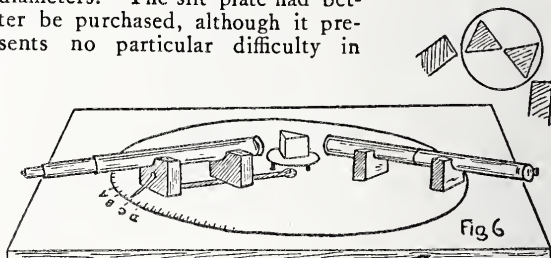


FIG. 6

manufacture, as the larger drawing at the side shows. The uncorrected plano-convex lens for the end of the collimator tube will cost about 50 cents (1/- to 2/-), and a 60-degree prism of 45 millimeters face and 100 millimeters high ($1\frac{3}{4} \times 4$ inches) can be obtained at the same place as the telescope for an outlay of \$1.50 (6/-). This prism is too long and must be cut into two equal parts, making it about 2 inches high by $1\frac{3}{4}$ -inch face.

Making a smooth working of the instrument. The Spectroscope cradles in which lie the telescope and collimator are sawed out of one block of wood, which has first been hollowed to receive the tubes, thus insuring equality in the height of the centers of both telescope and collimator. The collimator cradles are fastened down permanently to the base board on which has first been drawn the circle, as shown in the plan. The two cradles for the telescope are connected either by a strip of wood or brass, preferably the latter, which strip

*Apfel Murdoch & Co., 82 Lake St., Chicago, or any scientific instrument-maker.



FIG. 10. See page 42;

Upper: showing effects with an orthochromatic plate, without and with a compensating filter in representing "values" in sunlight
 Lower: Ortho plate, with and without compensating filter, showing comparative values. Subject, a dark blue-purple morning-glory, one white and two yellow nasturtiums

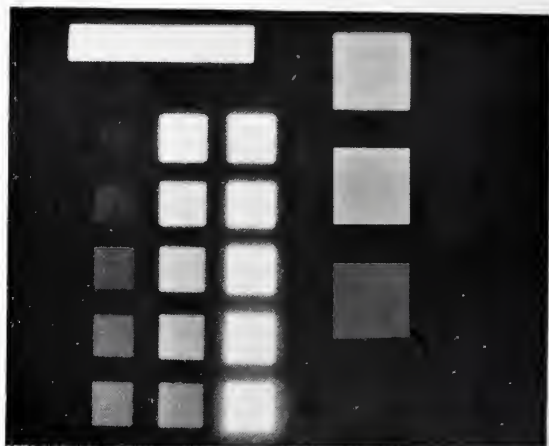


FIG. 11 (upper square). See pages 427 and 440
 FIG. 12 (lower square). See pages 427 and 440

extends forward and hooks over a small brad driven at the center of the circle, thus allowing the telescope when laid into its cradle a horizontal movement around the prism. The angle which the telescope makes with the collimator (the distance apart) will be *approximately* 130 degrees, but this angle will change according to the dispersive power of the prism.

The prism must be elevated upon a little table, so that it may be exactly the height of the telescope and collimator, and must also be perfectly upright, with its edges at right angles to the plane of the board. The top, bottom and back of the prism must also be blackened to avoid reflected light; only the two polished sides are required.

To find the correct position for the prism and adjust the instrument, swing the telescope, which has previously been focused upon some object more than 100 yards distant, until it is in a direct line with the collimator, and upon looking through the eyepiece the open slit can be plainly seen. The edges of this slit are sharply focused by pushing in or withdrawing the two tubes which form its body, and the relative position of the tubes marked. The collimator tubes are now fixed, as all further focusing is done by movement of the telescope. When focused the telescope is swung out of the way and the slit illuminated by a gas flame, the prism being placed upon its table in the position shown in the plan. Now move the telescope slightly backward or forward in horizontal arc, until the spectrum shows plainly therein.

The "position of minimum deviation," which is the correct position for the prism, is found by moving the prism around its own axis to the left of the observer, when it will be seen that the spectrum travels toward the right. Follow it with the telescope until it stops and begins to move back again. Just at the point where it stops is the position of the minimum deviation, from which all observations are made, and in which it should be permanently cemented. If the collimator be now directed toward the sun and the slit narrowed to an extreme, about 0.02 inch, the Fraunhofer lines may be clearly seen and focused with the eyepiece.

The arc which the telescope describes upon the base

board should be graduated in degrees and half degrees, as fine as possible, so that an indicator attached to the cradle may assist in determining position when using artificial light. By cementing a hair across the diaphragm in the eyepiece, and bringing it in accord with the principal lines in sunlight, the same position of the indicator on the circle will, at any other time and with any other light, serve as a guide to position, provided of course that the prism be not disturbed.

**Measuring
Color and its
Luminosity**

Several methods are employed for the accurate determination of the color constants mentioned in an earlier paragraph, only two of which I will briefly describe here. Abney's color patch apparatus easily stands at the head as the most scientific method yet invented. It consists of an electric arc lamp as a source of light, the beam from which is allowed to fall upon the collimating lens of a spectroscope, and from thence passes through the prisms of the instrument and into a photographic camera, on the ground-glass screen of which it is received as a spectrum.

**Abney's
Color-Patch
Apparatus**

About four feet from the camera is placed a white screen, upon which the rays can be received after the removal of the focusing screen. In place of the focusing screen is placed a large combining-lens, which collects the colors upon the white screen in the form of a patch of white light. By introducing a slit between the lens and the camera, the patch upon the screen will show only the color, or colors, which the slit allows to pass. A beam of white light reflected from the front surface of the first prism is conducted, by lens and mirror, also upon the screen. In this way are obtained two patches of white light from the same source, and practically equal in every respect.

A rod is placed in front of the screen, which is illuminated by both beams. If the intensities of both beams are equal, then the two shadows cast by the rod will also be equal in intensity. If one be stronger than another, then the beams are altered in intensity by placing in the path of either an instrument with a pair of revolving sectors.

This latter instrument consists of an electro-motor carrying on its spindle a fast and loose sector. This is so constructed that during rotation the aperture can be varied to any required degree, thus altering the amount of light it allows to pass. The color to be measured is placed on a rapidly revolving disc, together with variable discs of black and white, and the patch of light from the spectroscope is allowed to fall partly upon the color and partly upon the black and white discs. By moving the slit or slits along the spectrum the *color* may be accurately matched, while its *luminosity* is measured by the alteration of the proportions of the black and white discs.*

Lovibond's Tintometer The tintometer of Lovibond† is also a very ingenious instrument. It consists of a small rectangular box, broad at one end and tapering to the other, in which an eye-piece is placed; down the center is a partition dividing the instrument into two parts and having a knife edge inside of the point of vision. In one of the two tubes thus formed is placed the color to be measured, and in the other are placed a number of *standard color-glasses*, which are numbered. On looking through the eye-piece, a glance is sufficient to show whether or not a match has been made, and glasses are added or taken away until this is accomplished. Either transparent or reflected color can be measured with the instrument.

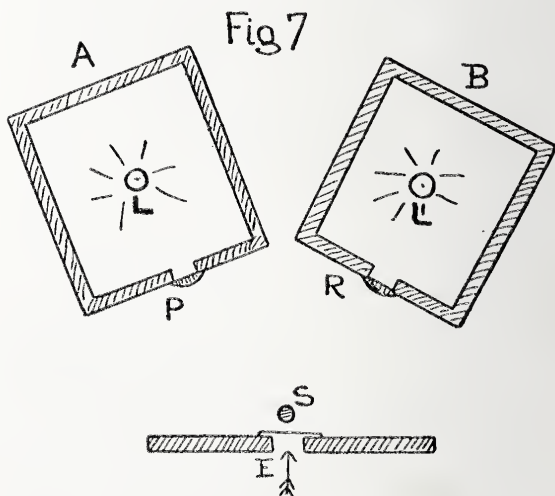
Luminosity Determination To the photographer the accurate determination of hue is not so important as the luminosity, and as a piece of simple apparatus, which any one can form for himself, there is nothing so good as an ordinary Rumford photometer, a modified plan of which is given in Fig. 7. The viewing screen is a vertical opaque shield with a translucent square at its center. Behind it, at a distance of an inch or two, is placed a cylindrical rod. As ordinarily used to compare the intensity of two flames, these are placed behind the shadow rod in such a way that each flame casts a separate shadow of the rod upon

* Abney: "Treatise on Photography." Edition of 1901.

† Lovibond: "Measurement of Light and Color."

the translucent screen. The observer stands in front of the screen and directs the removal of the lights either toward or from the rod until the two shadows cast upon the screen are equal in opacity. The squares of the distances between the lights and their shadows give the relative intensities of the lights.

The viewing screen shown with the shadow rod facing A and B in the diagram, should be opaque except for



a small square in the center, which should either be of ground glass or thin white paper and examined from the front at E. The colors to be measured are placed in front of each lens, and Kodak films, "developed to different densities, added to either, until the shadows appear equal in strength (or opacity). Several readings should be made for each color, and the *mean* taken. A Welsbach burner in each box makes a very suitable illuminant. Care should be taken that the shadows be equal, to start with.

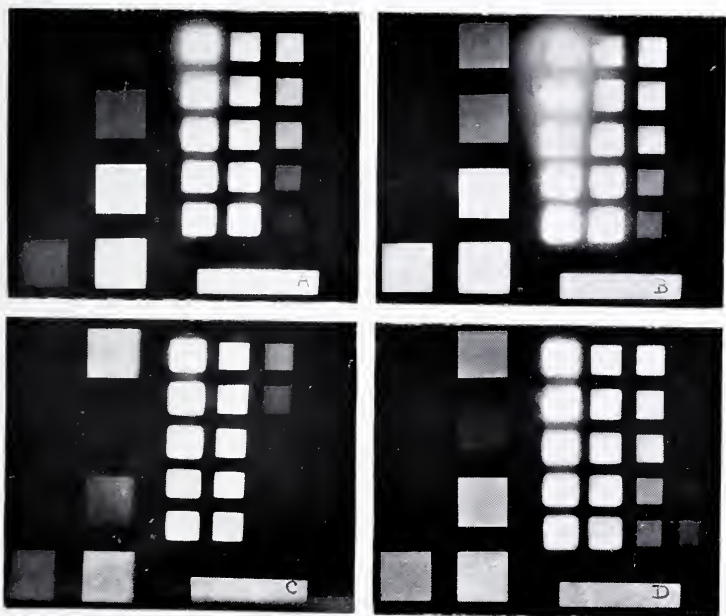


FIG. 13. See page 428



FIG. 16. See page 428

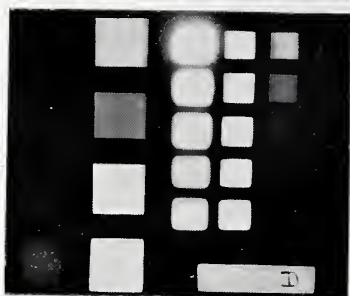
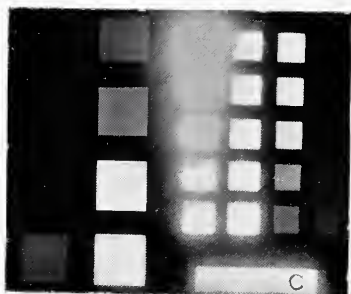
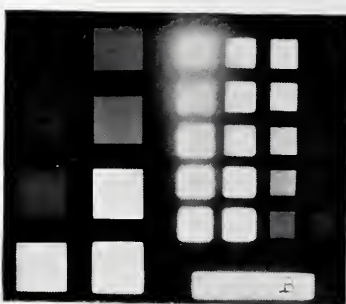
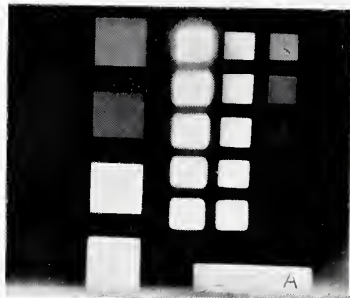


FIG. 14 See page 428

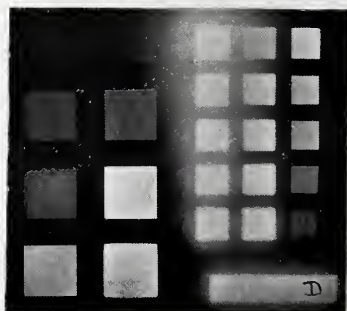
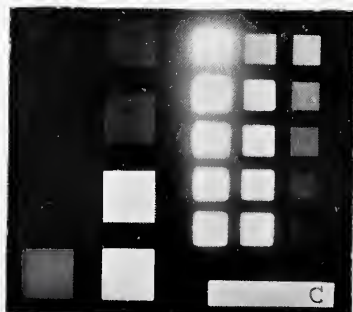
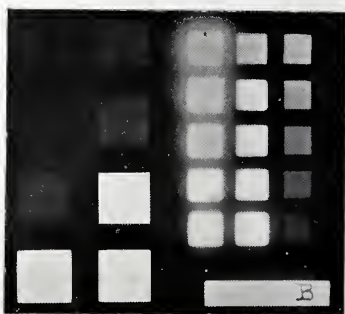
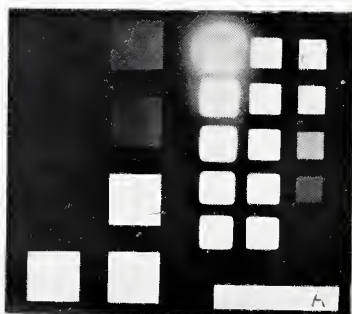


FIG. 15. See page 428

Color-corrected plates of the United States

Maker	Name of plate	Pure color sensitiveness. <i>Unscreened</i>	Adjusted screen	Remarks
Cramer	{ Instantaneous Iso. Medium Iso.	{ Yellow, Yellow-green, Blue-green, Blue and Violet.	Isochrom.	{ Blue-green sensitiveness is very low.
Cramer	Slow Iso.	Yellow and Yellow-green.		Also a <i>slight</i> sensitiveness to the blue.
Carbutt	Orthochromatic	Yellow-green, Blue-green and Violet.		Blue-green sensitiveness low.
Carbutt	Polychromatic	Sensitive to all colors.	Carbutt adjusted screen.	Sensitiveness to red rather low.
Hammer	Orthochromatic	Yellow, Yellow-green, Blue-green, Blue and Violet.		Weak in blue-green.
Standard	Orthonon	Ditto.		<i>Slightly</i> sensitive to the orange, weak in blue-green.
Standard	Orthochromatic	Ditto.		Weak in blue-green.
Seed	Portrait ortho.	Ditto.		Weak in blue-green.
Seed	Landscape ortho.	Ditto.	Chromatic curve corrector.	Fairly even distribution of sensitiveness in greens.
Forbes	Orthochromatic	Ditto.		Strong in yellow but low in both greens.

The "Erythro" plate mentioned in THE PHOTO-MINIATURE No. 6 is no longer in existence. Mention may be made of the Lovell C. D. plate, which, in the hands of the writer, gave a more truly orthochromatic effect unscreened than any other plate in the United States. Unfortunately it is not obtainable at present, although there is a probability that it will be in the market shortly.

Spectrum
Negatives

It must ere this have been apparent to the student of orthochromatism that no experiment worthy of the name can be performed, or no real deduction made, except by the aid of the spectrum. It must also have been equally apparent that such deductions necessarily entail a considerable amount of work. Not only has the spectrum negative to be made, but, after it is made, the varying deposit throughout its extent upon the plate has to be estimated; and against that estimate has to be calculated the percentage of luminosity for the different colors. For ex-

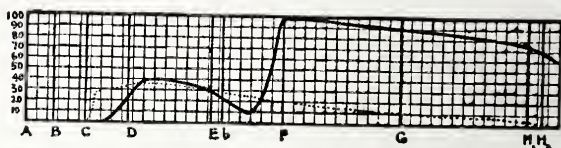


FIG. 8

ample, let us take a purely imaginary plate which has been exposed to the solar spectrum and whose opacity after development is represented in Fig. 8 by the heavy continuous curve.

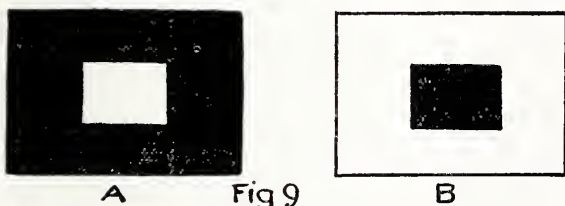
It will be seen that the greatest deposit lies in the blue about the region of the G line, while in the yellow at D the deposit rises to 40. At first sight it might be supposed that the plate sensitiveness would be recorded as

Blue	Yellow	Y-Green	Blue	Green	Orange	Violet & U-V.
100	40	30	10	5	75	

But this would be entirely wrong. What about the visual luminosity of the lines photographed? In the first place, the brightest color in the entire spectrum is the yellow just beyond the D line toward the blue, next the yellow green at Eb, then in orderly sequence comes the orange, blue-green, red, blue and violet. It is this range of color luminosity which we must aim to reproduce in correct gradation. To make the subject thoroughly clear, let us affix numbers to these colors, thus -

Yellow	4.0
Yellow-green	3.5
Orange	3.0
Blue-green	2.5
Red	2.0
Blue	1.5
Violet	1.0

Now comes in the true deduction, for as the yellow is in reality 30 times brighter or more luminous than the blue, then a true curve of opacity on the negative would



require to show that yellow as 3,000 (100 x 30), provided the blue at G was considered correct. To correctly represent that part of the spectrum to which the plate is sensitive, the opacity curve should be as shown in the dotted line on the same figure.

Now, what does this amount to? Simply to the fact that this plate entirely reverses the correct order of luminosity, and supposing we should attempt to reproduce a color patch consisting of a square of pure yellow surrounded by a square of pure blue, as at A, Fig. 9, a print from this plate would show it as at B.

It must not be supposed that this example or illustration is a purely imaginary one; unfortunately it is far from it. The curve of sensitiveness shown in Fig. 8 is not so very far removed from several widely known so-called ortho- or iso-chromatic plates, and attention is now directed to Fig. 10 (half-tone illustration) where the "before and after" effects are very well shown, together with the necessary data. The failings of the

ordinary plate, and the necessity of the supplementary screen are plainly evident in these two prints.

A series of similar experiments, which any reader can undertake at his leisure, will offer convincing proof of the importance of the claims made for the adjustment of suitable light filters to the various brands of orthochromatic plates available. Especially is this adjustment necessary in commercial photography where color is concerned, in the photographing of flowers, interiors, fabrics and color designs. When this lesson has been learned we will hardly use ordinary unorthochromatic plates save for the reproduction of black and white designs or objects in neutral tints.

It would be but a poor physician who, diagnosing a disease, could not suggest, if not a remedy, at least some method of alleviating the trouble. So, having now commented upon the troublesome spectrum readings, the writer ventures to suggest a method which greatly simplifies these delicate results.

It is possible to divide the spectrum up into definite and distinctive colors which are always "standard," the Fraunhofer lines serving as stationary markers. Thus A to B represents always one same unvarying hue of dark red, while E to b represents a definite hue of yellow-green.

Now, how much easier would it be for the student of color if he could obtain a spectrum in which every color was of *exactly* or even *approximately equal* luminosity—say 20 units; then all that he would be required to do would simply be to expose his plate and make a direct reading; and if one region was represented by a greater deposit n , such deposit would show the plate to be n times more sensitive to that region or hue than to another.

It is possible to find among the many thousands of the so-called anilin dyes either single colors or combinations of the same, which will transmit only certain definite portions of the spectrum. After much experimenting, the dyes which the writer finds best suited are tabulated herewith complete, with their absorption and collective transmission.

Dyes suitable for light filters

Dyes	Absorption	Visual Hue	Transmission
Picric Acid, Ethyl Violet, Fuchsin and Light Green, F.S.	Everything but extreme red. Bunsen scale: 2.9.	Dark Red	Fraun. lines A to B
Picric Acid + Fast Scarlet + Ethyl Violet.	Everything but full rich red. Scale: 3.5.	Bright Red	" A to C
Uranin + Erythrosin + Orange G.	Absorbs everything but red and orange Scale: 4.5.	Bright Red.	" A to D—
(Same as preceding but bathe lighter.)	All but red, orange and yellow. Scale: 5.2.	Orange.	" A to D +
Light green + Naphthol green + Chrysoidine	Absorbs everything but a band of yellow- green color Scale: 5.0 to 7.5.	Yellow- Green.	" D to b
Light green + Naphthol Green + Picric Acid.	Absorbs all color but a band of blue-green Scale: 7.1 to 9.0.	Blue- Green.	" E to F
Methylene blue + Naphthol green + Picric Acid.	Absorbs all but band of blue color. Scale: 9.0 to 12.7.	Blue.	" F to G
Ethyl Violet.	Absorbs all color but two bands —red and violet re- spectively. Scale: 3.5 12.7.	Violet.	" G to H + (also A to C)

Wallace's
Spectro-
Sensitometer

It will be seen that these dyes as thus arranged divide the spectrum into eight definite portions according to the disposition of the Fraunhofer lines. Small portions (about one inch square) of ordinary undeveloped dry plates may be fixed out in hypo, and after washing, be stained by bathing in these dye solutions. Of course the depth of the staining and the relative amount of the dyes will determine the absorption of the finished result. If bathed too lightly, or if the dyes be insufficient in quantity, the glass will transmit more color than is intended, and sometimes even other hues. If bathed too strongly, the complete spectrum will not be represented but will be cut up by dark absorption bands, and other hues may be transmitted. It is impossible to give more definite instruction on this point, as the *colors* must be adjusted by the spectroscope, and by a good spectroscope at that,—one which possesses either a reflected scale, or is possible of angular movement on horizontal arc, and the relation of whose scale to the Fraunhofer lines is definitely known.

The color squares are now arranged side by side, either in one or two rows as is convenient, and presents a complete artificial spectrum transmitting pure spectral hues, but still of varying luminosity.

This latter point is easily overcome, for upon looking at the row of colors some will be bright and luminous, while others appear dark. If properly bathed glasses have been used it will be found that Nos. 1 and 7, A to B and F to G, are the darkest or least luminous of the set. Select the darkest, and dim down or reduce the luminosity of those brighter to the same key. A simple method of doing this consists in developing (in ordinary daylight) some few pieces of kodak film to various degrees of opacity in a hydroquinone or other non-staining developer, then fixing and washing thoroughly, when, with the aid of the simple Rumford photometer described in Fig. 7, the luminosity is easily adjusted to a very close approximation, by placing the darkest square in front of one hole and adding successive pieces of film to the lighter color glass in front of the other hole. When the shadows appear of equal

depth throughout, the luminosity is sufficiently accurate. Small pieces of the film are now cut to cover the glass just tested, and the same thing is performed with each of the others; then all are carefully bound with ordinary lantern-slide binding strips.

We have now an artificial spectrum in which each hue is of equal luminosity. The squares will appear dull and dark, but this is simply owing to the fact that their luminosity is so low. Should they be held in front of a strong source of light, such as the electric arc, then they will again appear clear and bright. The use of such an instrument, which has been named the Spectro-sensitometer, must now be obvious. All that is necessary is to place it in contact with the small sensitive plate which one is desirous of testing, and expose to the light for a short interval, and upon development the color-sensitiveness can be estimated directly by the eye without any further apparatus. It stands to reason that, given a plate sensitive equally to all the rays of the spectrum, such sensitiveness should be indicated by an equality of deposit under each of the eight color squares, the absence of any one instantly indicating the lack of sensitiveness to such color. A stronger sensitiveness to any particular portion of the spectrum is of course indicated by greater opacity under the particular square which transmits that portion of the spectrum.

It is not generally known that an "ordinary" unorthochromatized plate is, upon lengthened exposure, sensitive to the less refrangible rays, even into the extreme red between A and B. That such is the case is shown in Figs. 11 and 12 (half-tone illustrations), where the normal exposure is shown side by side with the same exposure increased 60 times.

That this point of normal exposure be correctly arrived at in the simplest manner, it would be a good plan to also have a small piece of a "medium" negative, as in the Chapman-Jones "plate-tester." By medium is meant a negative which is neither too dense nor too thin,—just an ordinarily good negative, with the exposure so timed as to give upon development a fairly good positive. By this means a check will be kept

upon correct or "normal" exposure, and false deductions avoided.

How much easier it is to obtain an approximately correct reading of plate-sensitiveness with the Spectro-sensitometer than from the spectrum direct, is left for the illustrations in Figs. 13, 14 and 15 (half-tone illustrations) to show, and the reader to judge.

Some few months subsequent to the introduction of the Spectro-sensitometer by the writer, Belin of France, in a communication to the Société Française de Photographie described a new instrument for the determination of color-sensitiveness of gelatine plates. The instrument invented by him, and also named a Spectro-sensitometer, consists of the applicability of a normal spectrum from a diffraction grating and marks a decided and original advance in methods. Briefly described, the instrument is as follows: A transparent diffraction grating is so situated that a beam of white light proceeding from a slit passes through and is projected in the form of a spectrum upon the sensitive plate which it is desired to test. As the spectrum is formed by a grating, it is of course "normal"—that is, the color is proportional to the wave length, and the dispersion dependent upon the number of lines in that particular grating used. The originality of the device lies in the peculiar mechanism of the slit, which is in reality double—one before the other, and which by a particular movement is caused to be alternately opened and closed from the top downwards, thus giving upon the sensitive plate a spectrum which is constantly being covered and opened in a direction vertical to its length, so that instead of the image (upon development) being confined sharply between definite bounds as in A, Fig. 16, a brief exposure results in an effect similar to B, the height of the ordinates being proportional to the sensitiveness of the plate and the length of exposure.

In practice the briefest possible exposure is given which will produce a developable image; this image is then placed against a key-plate which contains a chart of the spectrum, with the Fraunhofer lines, luminosity and wave length, marked thereon, by which means the



FIG. 19. See page 433

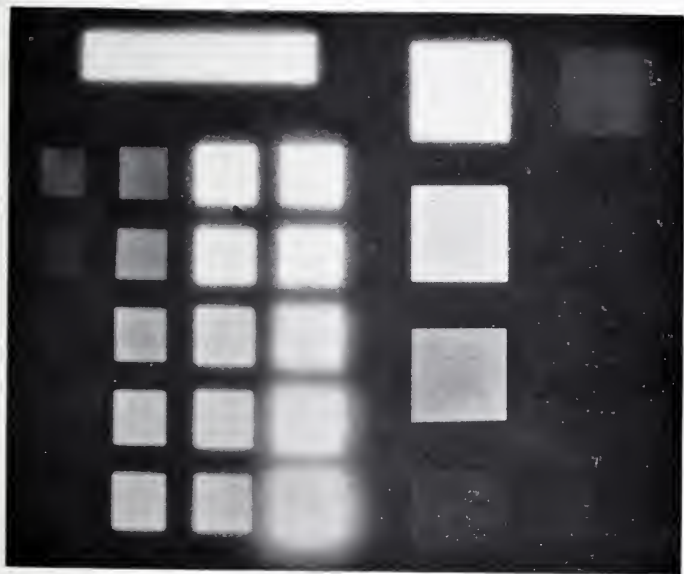


FIG. 21. See page 440

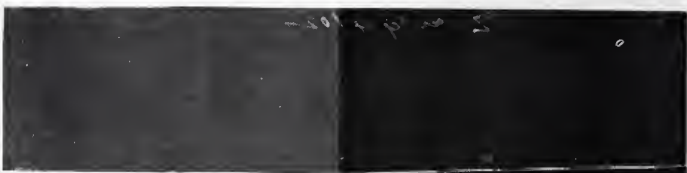


FIG. 23. See page 442

A



B



C



D



E

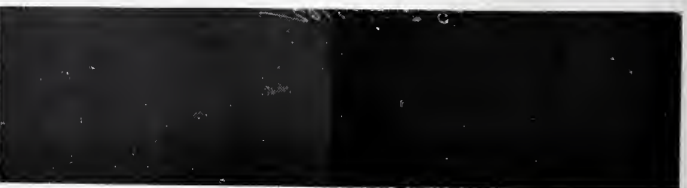


FIG. 22. • See page 440

A: Ruby and yellow. B: 2 Ruby + 1 yellow + 1 orange fabric. C: Ruby, yellow, violet, crimson. D: Ruby, violet, yellow, green. (This print is purposely made light in order to show the slight deposit more clearly. If printed darker the difference is not so apparent.) E: Extended exposure on D.

general sensitiveness and speed of the plate may be correctly estimated direct.

Abney's
Color
Sensitometer

At the close of the year, 1899 Sir Wm. de W. Abney described a new sensitometer for the adjustment of photographic plates and screens for orthochromatism.

He describes this as follows: "My new sensitometer consists of pigments toned down by a mixture of black. Supposing we have a white with a luminosity of 100, a black with a luminosity of 0, and a blue which has a luminosity of say 10. Then, in order to make the white of a luminosity equal to the blue, it is evident that we must have only one-tenth its luminosity. If, then, in a rotating disc we have a central portion all blue and a ring of white outside it, we must cover up nine-tenths of such ring with black, supposing it has no luminosity, and the blue and the gray will then be equally luminous, for only one-tenth of the light from the white ring will strike the eye, whilst the whole of the blue light is perceived. If we take a yellow, which is only one-half as luminous as the white, that is, five times more luminous than the blue, we must have another segment of a ring of yellow one-fifth of the circumference of the circle bounding it, the rest being black. When all three are rotated together the luminosity of each will be the same. If, then, we take a photograph of such a rotating part-colored sector, we must use a screen which will cut off such quantities of light from each as will make the densities of the sector and of each ring the same. If the yellow (say) is too dense when a certain screen is used, we shall know that we have to use one which lets more blue through, and so on. Here it is that the common sense of the experimentalist must aid. He must remember that the complementary color of that which gives too great density must be added, or it may be a mixture of two complementary colors when the rings are each of varying density."

The
Color Disc

The writer has had ample opportunity to test the practicability of this method and cannot speak too highly of the general results. The disc is easily made and a variety of ways will immediately suggest themselves as to its rota-

tion. Briefly considered, eight concentric circles are struck on cardboard of good quality (having a firm and white surface), and the various colors are painted thereon in the proportions necessary to obtain approximately equal luminosity when the disc is rotated.

The colors and their relative luminosities, as selected and measured by Abney in the light of the electric arc, were:

White . . . 120	Zinc white.
Yellow . . . 70	Chrome yellow.
Red . . . 45	Vermilion.
Green . . . 32	Emerald green.
Blue . . . 16.8	French blue.
Violet . . . 12.2	Name of violet not given and the color itself later dis- carded by Abney.
Black . . . 2.0	Lampblack.

The colors used by the writer in the construction of the disc were selected as possessing greater purity of hue and are as follows:

Red . . .	Vermilion and crimson lake.
Orange . . .	Vermilion and cadmium yellow.
Yellow . . .	Aurora yellow.
Green . . .	Emerald green.
Blue . . .	French blue.
Violet . . .	French blue and crimson lake.

The luminosity determination for their colors by daylight is as follows:

Color	Luminosity	Color arc in degrees		Black
White	100.0	360°	+	. .
Red	28.0	259°	+	101°
Orange	60.0	145°	+	215°
Yellow	70.0	107°	+	253°
Green	50.0	180°	+	180°
Blue	24.0	274°	+	86°
Violet	6.0	338°	+	22°
Black	1.0	. .	+	360°

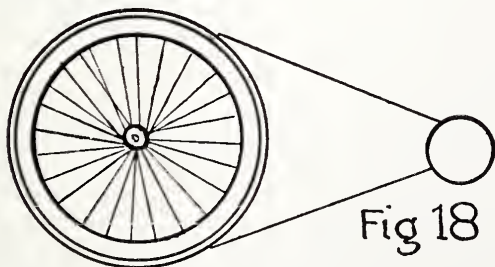
To determine the arc which each color will subtend, it is only necessary to interpolate the reading from a circle whose circumference is divided into 100 into that of 360, as shown in the third column under "color arc," while the fourth column indicates the amount of black.

**Making a
Color Disc**

All estimates being already made, it is now an easy matter for the photographer to make up the disc. Purchase the water-colors in tubes, and lay them on the paper in good generous washes in the various spaces, filling in the remainder with solid washes of lampblack. Fig. 17 shows plainly the appearance presented by the finished disc, and all that now remains is the method of whirling. A small motor, driven either by a small storage battery or from the ordinary lighting circuit, is by far the best; but the effect is just as good if it be run on a small one-inch pulley, and driven by a bicycle wheel with an endless cord, as indicated in Fig. 18, where the small circle represents the color disc.



FIG. 17



It will now be apparent to the reader that when the disc is in rotation all the color rings will be of equal luminosity, and a photographic plate if *perfectly orthochromatic* should represent the whirling disc as one uniform gray—that is, except the white ring and black

circle. As no rings will stand out with greater deposit than others, and it is the business of the screen or filter to bring them into harmony, there is where the "adjustment" comes in! First, a negative without a screen indicates plainly the initial color-sensitiveness of the plate. By observation of this negative, note is made of the circle which shows greatest density, and a filter is made up of a color complementary to that color. For example, the blue is the ring showing greatest density on the negative, and therefore requires toning down to bring it more in accord with the others; as yellow is the complementary color to blue, the basis of the filter should be yellow. Another exposure is now made, but this time through the yellow filter. The blue ring will now be found to be greatly subdued, but it may be that the yellow ring is now too prominent. The remedy is obvious; the complementary color to yellow is a blue or a blue-violet, so a little of that color dye must now be added to the yellow filter, making it more or less greenish in hue, and so on from one ring to another, altering the amount of the dye-stuff added, until, as before stated, there results a uniform gray deposit throughout the color rings, on the development of the normally exposed negative.

Adjusting Plate and Filter How long does it take to adjust a filter to a plate? It is impossible to answer this question. It may be completed in a day or it may require many days. It is simply a case of "trial and error," and cannot be hurried or pushed.

As I have said, all bromide of silver plates are sensitive up and into the red upon prolonged exposure; and, as every addition of dye prolongs the length of exposure, it will be seen that the red and orange rays have therefore more time in which to impress themselves, so that what we lose in the one place we gain in another. Another feature is the fact that, although the absorption of the filter, when finished, may be such that the violet and indigo blue of the spectrum is entirely cut out (absorbed), yet in nature we are not dealing with the problem of *pure* color, but *mixtures*. A violet, for example, does not reflect simply violet alone, but also

blue, red and green, so that the action may be obtained upon the plate by the action of these various rays either collectively or singly. For this reason it is not advisable to use the spectrum to *discover* the proper screen, but its use is inestimable in duplicating the original.

That this is so must be apparent to all who give but a cursory examination of Fig. 19 (half-tone illustration), the spectrum of the Cadett "Absolutus" filter; where, as is plainly shown, the spectrum ends very abruptly between b and F in the green, entirely absorbing the visible blue and violet. Such a filter, as we see, does not aid in the correct representation of the spectrum (pure color) but is excellent for the reproduction of natural objects (reflected color).

In an article published in "Photographische Correspondenz" and translated in the British Journal Almanack for 1902, Dr. Greebe of Jena enters at length into the various qualities of light filters and has divided them into three classes of "photographic, visual and bolometric," respectively. Of these only the first need be considered here.

After a comparatively exhaustive résumé upon the subject, Dr. Greebe takes up this class under the

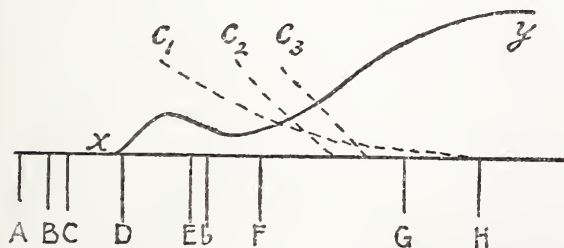


FIG. 20

correct head of "Compensating Filters" and says: "The selection of the best possible compensating filter depends upon the nature of the process* curve, as shall shortly be described. The process curve, as

* Meaning the curve of color-sensitiveness of the plate.

might be expected, also depends upon the quality of the light used. This may be selected in such a manner that a compensating filter becomes superfluous. Good compensating filters should not entirely eliminate any visible zone of the spectrum, as for instance C₂ and C₃ in Fig. 20. They should only subdue, as in the case of C₁. On the other hand, the ultra-violet should be quite eliminated."

With reference to the foregoing statement and diagram, I regret that the admirable researches which have been conducted by Dr. Greebe have led him to arrive at conclusions with which I cannot wholly agree. I refer particularly to the curve of C₁. We must remember that the plate (unscreened) is sensitive in a much greater proportion to the action of blue and violet, and that the dimming action exercised by a filter such as would correspond to the curve indicated therein would still allow much too great an effect by these rays. That I do not stand alone in this opinion is proved by the fact that the "Absolutus" filter adjusted to the Cadett Spectrum plate entirely eliminates these very lines, as is shown in Fig. 19, a photographic record of that plate and filter.

I think that the eminent Doctor must himself unconsciously agree with this opinion, because, later in the article referred to, he pays a strong compliment to the "Absolutus," and especially mentions that he "*always uses Cadett's Spectrum plates with compensating filter for his experimental tests.*"

Commercial
Adjusted
Filters

Since the publication of THE PHOTO-MINIATURE No. 6, there have appeared three new adjusted filters manufactured for the Carbutt Polychromatic, Cramer Isochromatic and Seed L Ortho plates respectively,—which is strong evidence of the recognition of the advance of knowledge on matters orthochromatic. It is not necessary to discuss the merits of these filters at greater length. Their results speak for themselves, as shown in the several test illustrations throughout this monograph. In England we have the "Absolutus" filter for the Cadett plate, and measured screens for other makes such as the Ilford and Mawson plates.

Home-made
Filters

In THE PHOTO-MINIATURE No. 6 several methods were given for the manufacture of suitable color screens, of which the principal were collodion, celluloid and gelatine. The writer has had considerable experience in this line of work, and from a summary of results has arrived at the following conclusions: Celluloid is altogether too messy to handle and requires to be kept absolutely level until dry, which takes several hours—depending upon the size of the filters and their number. Apart from this, there are only a limited number of dye-stuffs which are soluble in amyl acetate, and the introduction of alcohol is not attended with the most beneficial results.

Coming next to collodion, we find some very high authorities stand sponsor for its good qualities, in the foremost rank of which we must place Mr. Frederic E. Ives, an able and distinguished investigator.

From careful observation I do not think that the majority of people find the flowing of a plate with collodion a particularly easy task. There is a certain "knack" in the operation which can only be acquired by practice, and, although I have hitherto been an advocate of collodion as an easy and quick method of screen making, yet I have recently had occasion to fall back, and rely solely upon gelatine.

The editor of the *Amateur Photographer*, speaking of collodion screens, says: * "In the *Amateur Photographer* for July 3, 1896, we give a long account of a demonstration of the making of stained screens by Mr. Ives; this demonstration having been given at the meeting of the Royal Photographic Society held on June 23, 1896. The demonstration was straightforward, full and complete, there being no reservation of any kind. The screens then prepared by Mr. Ives consisted of a collodion film stained with 'brilliant yellow,' and cemented by means of Canada balsam, between two pieces of plane-parallel glass. So perfect were these screens at the time of making that when used with an ordinary plate they gave practically orthochromatic effects, thus realizing the Crookesian orthochromatic

* *Amateur Photographer*, August 21, 1902, p. 145.

method of 1858. A screen prepared by Mr. Ives at this meeting (six years ago) is now in our hands. The enclosed film has, however, become as dull or matt as ordinary ground glass, but irregularly so, or in patches; in short, the screen is quite useless." It is sufficient to note that if the screens made by such a careful worker as Mr. Ives and so disastrously, in such a short time, they are entirely out of consideration.

Celluloid and collodion being thus disposed of, we are of necessity compelled to rely upon gelatine. There are several methods of using this medium. First, as described in THE PHOTO-MINIATURE No. 6, by staining a selected dry plate which has been fixed and washed; second, by flowing glass with plain gelatine solution and then staining; and third, by incorporating the dye-stuff in the gelatine and coating selected glass with the colored solution.

This latter is decidedly the better way, and, although care is needed in the handling, yet one is well repaid by the excellence of the results.

The general instructions given by Dr. Miethe* upon this subject are very comprehensive, and the results are certainly everything that could be desired. I quote: "The coating solution is prepared from gelatine—the most transparent procurable (the half opaque emulsion gelatine is useless), which is swollen in seven or eight times its weight of cold water, and liquefied by warming on a water bath. It is filtered through a hot-water funnel, passing rapidly through the paper when in a warm condition. The coloring matter—of which later—is now added, and the exact volume of solution for a given size of plate carefully measured out and poured onto the glass. The latter should previously have been warmed on an iron plate exactly level and gently heated by a rose gas-burner underneath. The solution having been allowed to spread over, the plates are left to set, and are now first placed vertically, so as to prevent dust settling on them, and dried in a room at a uniform temperature.

*"Plates and Light Filters for Orthochromatic Photography," Miethe, *The Photogram*, March, 1902.

They must now be provided with a cover-glass, for which a stout glass plate, likewise parallel-sided, is used. The coated plate is brought on to some support carefully warmed to 50°C . (120°Fahr.), a few drops of Canada balsam poured on, and the warmed cover-glass laid very slowly on. The temperature of the support is now gently raised to 70°C . (158°Fahr.), and the Canada Balsam gradually spreads itself between the two glasses, the excess escaping at the edges. The temperature is now reduced to $40^{\circ}\text{--}50^{\circ}\text{C}$. ($105^{\circ}\text{--}120^{\circ}\text{F}$) and the superfluous balsam cleaned away with xylol. The finished filters are then bound with paper edging and are ready for use."

The writer has in his possession a number of gelatine filters made in a manner similar to the above, which, at present writing, are upwards of seven years old and which are still as perfectly clear and translucent as on the day they were made.

For all the experimental work which must be undertaken before one arrives at the formula necessary to the manufacture of an adjusted screen, it is better to use a liquid filter. In fact this is the *only* way to work, for the numberless variations in the quantity and nature of the dye-stuffs render unavailable the idea of experimental work in gelatine. There are a variety of ways in which a parallel-sided tank can be quickly made, and these will readily suggest themselves to the student. The B. & L. Ray Filter tank offers convenience here. Careful notes are kept of every change in the addition or subtraction of dyes, and the gelatine solution made up to correspond to the spectroscope reading of the tank filter, in the manner already described.

As a plate must be carefully tested for its original color-sensitiveness, so must the screen and plate together. For this purpose various ingenious pieces of more or less complex apparatus have been used by different workers.

First in order comes the photospectrograph, and closely allied thereto the Diffraction Spectroscopic Camera devised by Tallent. Both of these instruments simply throw a spectrum directly upon the sensitized plate.

Testing
Screens
and Filters

For the study of screen absorption the filter under test is simply placed before the slit of either instrument.

It will be readily understood by the student, from what has gone before, that even to the photo-physicist such results must be very difficult to read, and far more difficult to make deductions from; first, because of the inequality of the luminosity of the various spectrum hues, and second, because of the fact that all instruments of this nature project *pure monochromatic color*, which is not at all what is met with in nature. A filter perfectly adjusted to "natural colors," i. e., mixtures, and giving results of the highest order, would be utterly incapable of representing the spectrum with even an approximate approach to truth.

That this is so is proved by the fact that in Fig. 19, where is shown the spectrum record of the Cadett Ab-solutus filter (one of the most perfectly adjusted filters manufactured), the absorption spectrum B taken through the screen—on its own plate—at its own multiple of exposure—gives a result which is ridiculous if considered as a representation of the spectrum. *If a filter is to be adjusted for results in mixed color, then it must be determined with an instrument passing mixed color.*

The spectroscope (either in the form of the photo-spectrograph, the Tallent Spectroscopic Camera, or any similar instrument) being thus shown to be unsuited for use in this work, we next come to the glass color sensitometer of Edgar Senior,* which consists of four squares of glass, colored red, green, blue and white respectively and reduced to equal luminosity. The writer has not had the opportunity of personally working with this instrument, so therefore cannot speak authoritatively, but from the rather meager descriptions given by Mr. Senior and from the more definite data given by Abney† (from whom the instrument is copied, with due acknowledgments) we understand that the glasses are selected as passing "*mixed*" colors and "have the advantage of . . . balancing, as it were, the excess of one spectrum ray with the defect of another."

* Process Year Book 1900, p. 69, "Testing light filters for use in Orthochromatic Photography," E. Senior. Process Year Book, 1901 p., 33, "Testing Screens for three-color work," E. Senior.

† "Instruction in Photography," Abney, p. 334.

This passing of mixed color is a strong point in the instrument and, provided the mixtures are reasonably near to "natural color" mixtures, should be very useful. The rotating cardboard sensitometer of Abney, as previously described, is to the mind of the writer one of the best methods for screen adjustment. The standard color spectrum printed by Prang, of Boston,* is also an excellent subject for indicating approximate results with various filters, but is of course of no use whatever in "discovering a filter."

The photographing of color charts is also to be strongly recommended. Several of these have been published from time to time. (See illustrations in plate A.)

Many a plate is placed upon the market as possessing sensitiveness to—say, yellow and orange—simply because the manufacturers had made a "test" by photographing a number of color patches (pigments on paper) where the deposit on those two colors could have been due merely to the red, green or green-blue which these colors also reflected.

Appreciating now, as one must, the advance in orthochromatic plate and filter manufacture, it is most fitting that we give some consideration to the dark-room light. For orthochromatic plates the illumination of the dark-room requires special care. It should only be illuminated by the extreme red rays.

I also quote from Tallent† as follows: "When using plates which are sensitive from end to end of the spectrum, the observation of the plate becomes a matter of difficulty. Even when no light is required during development, as when the development is timed, this universal sensitiveness becomes a nuisance, as it allows of no light being used in the manufacture of plates. To avoid this difficulty, the Cadett Spectrum plates have a narrow gap of red insensitiveness near the end of the visible spectrum. This, though not appreciably affecting the image, allows of a faint red light being used during the operations of coating and examining the plates."

* See illustrations on Plate A.

† "Handbook of Photography in Colors," 1900. Bolas, Tallent and Senior.

We next quote from general instructions published in several "manuals;" "Take a plate of the highest sensitiveness — and put it in the plate-holder, draw the slide so that half of the plate is exposed for about four minutes, and place it where you have the plate while developing. Now, develop in perfect darkness about four minutes and wash and fix as usual. If there is any difference between the exposed and unexposed part of the plate it shows that the light is not safe."

Influence of Exposure If the reader will refer to Fig. 12 (half-tone illustration) which is a spectro-sensitometer record of a Seed 26X plate *unorthochromatized*, he will see that it is simply a matter of length of exposure as to what colors may affect the sensitive film. With normal exposure the plate is sensitive only to the blue and violet of the visible spectrum, Fig. 11 (half-tone illustration) and slightly into the blue-green; but we find that if we increase the time of exposure we can have a decided action under every color square. That this action is progressive throughout the spectrum in orderly sequence is shown by Fig. 21 (half-tone illustration) where, with an exposure of only twenty times normal we see the action extending only to the red at C, although it will be noticed that the forced sensitiveness is shown by a considerably weaker action.

The writer has many times, following out a suggestion of Abney, made use of an ordinary plate for obtaining negatives of the red end of the spectrum, using an intense beam of light from a heliostat and thereby reducing the exposure to a minimum.

It must now be understood that given "Safe-Lights" a photographic plate sensitive to all rays of the spectrum *with sufficient exposure* there can be no visible light which is *absolutely* safe, but only comparatively so. The word "safe-light," as applied to orthochromatic plates, is a misnomer, although some lights are safer than others.

To test this matter more definitely in a way which would be in accord with the instructions of the "manuals," I recently made a series of experiments along the lines therein ordered, of which Fig. 22 (half-

tone illustration) shows the result. The data concerning the experiments is as follows:

Size of illuminated pane	8 x 10
Illuminant	gas
Pressure	3 inches
Burner	No. 5 Bray
Distance of plate from lamp	12 inches
Time of exposure ($\frac{1}{2}$ the plate)	4 minutes
Plate used	Seed L. ortho.
Developer	Pyro
Time of development	4 minutes

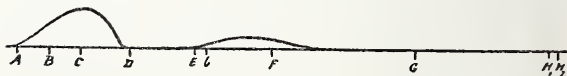
For the first exposure the light consisted of one sheet double-flashed ruby and one sheet stained yellow (the latter absolutely cutting out violet and ultra-violet together with the majority of the blue). The result of development is shown in A, Fig. 22. B represents two sheets of ruby glass, one stained yellow and one sheet "orange fabric." C shows the effect of a combination of stained violet, yellow, and red glasses plus one sheet ruby, and transmitting only the red and a small portion of the orange from A to C of the spectrum. In D is shown the effect of the same combination of glass as used in C, plus one sheet of stained green, the entire combination *transmitting light only from A to B of the spectrum and of low luminosity.*

It will be seen that even in the case of this latter combination there is a slight effect upon the plate which, if exposed for a long time, would show cumulative action, as is proven by E, where the plate was exposed 15 minutes.

The "manuals" naively state, "then the light needs still further dimming," but they don't state by what medium. Ruby glass of best quality transmits not only the red and orange, but also a considerable quantity of the green. The use of two sheets simply dims down the luminosity not only of the green but also of the red, and the same is true of six or eight sheets. Orange fabric is not a homogeneous medium, but is full of small holes which, when examined in the spectroscope, transmit light of every color, dimming down from the violet into the blue-green.

It will thus be seen that such instruction is worse than useless and is but a relic of a bygone photographic age—the collodion period. It will be found not only an interesting but an amusing pastime to go over the pages of some old photographic "guide book," as, for example, "The Silver Sunbeam,"* and see how many of those old ideas are still held as fetishes which every modern investigator knows to be false.

Any light is a "safe light" for an isochromatic plate which transmits monochromatic light from only the extreme red end of the spectrum, say from A to C. It is not sufficient that the result looks red; it must be spectroscopically correct, and the only way to test is by photographing the spectrum through the "safe light" upon a plate ordinarily insensitive to the red except upon prolonged exposure. In Fig. 23 (half-tone illustration) is shown the result of a *60 minutes exposure on a Seed 26X plate through the combination "safe light" C*, which



FIG, 24

proves conclusively that no other light save red alone is transmitted. In Fig. 24 is shown the spectrum of one sheet double-flashed ruby.

In submitting a dry plate to such a test as that commonly proposed; viz., the exposure to the dark-room light, it must be remembered that such a "test" is very severe and entirely aside from the conditions governing development, or other dark-room operations. Here we have a perfectly dry plate exposed to a large source of light (for in this case the ruby glass is considered as the light source, not the luminant), and, remembering that the intensity of the light is the inverse of the square of its distance, we can see what a great opportunity there is for it to produce fog. In the process of development the plate is *wet*, in which condition it is not so sensitive,

*"The Silver Sunbeam." J. Towler, M. D. 1873.

and besides, just as soon as development begins the exposed surface is protected by the silver deposit to a considerable extent.

The orthochromatic plate is very sensitive to green, and that is just what the ruby transmits; consequently there is almost always more or less veiling over the plate. A light truly monochromatic transmitting only red would keep the plate clear and clean. Such a light would be a "safe light."

The Cadett plates of England and the Carbutt, Cramer and Seed orthochromatic plates in America now have "safe lights" adjusted to them, obtainable at reasonable prices, which transmit pure monochromatic light. Appreciating the fact, however, that there are those who would rather construct for themselves that which they may be amply able to purchase, *THE PHOTO-MINIATURE* No. 6 offers a formula for a light which is "safe" for all the orthochromatic plates in the market with the exception of Carbutt's polychromatic, provided always that the methyl violet is made deep enough to absorb the yellow and yellow-green.

**Acknowledg-
ment** In bringing this monograph on orthochromatism to a conclusion the writer acknowledges his indebtedness to the literature which may be found scattered throughout the various photographic and scientific journals of both the United States and Europe. Because of this very scattering, it is not possible to append a bibliography of the works upon this subject; for although much has been written that is of unquestionable worth, yet it has mainly been in addresses or papers communicated to the various societies and published in their reports.

The general aim throughout has been to treat a technical and deeply scientific subject in a simple and instructive way, so that all might freely understand and appreciate the information made available. Some portions of the work contain a certain amount of original research, which the author presents in the hope that even that little may further the advance of orthochromatic photography.

R. JAMES WALLACE.

BOOKS

Apart from a few more or less obsolete manuals in French and German, the literature of orthochromatism is largely buried in the photographic journals. The following list of handbooks may, however, be found useful to the student who desires general information on the subject.

Orthochromatic Photography (THE PHOTO-MINIATURE No. 6). 1899. 25 cents.

Color Photography (THE PHOTO-MINIATURE No. 38). 1902. 25 cents.

Isochromatic Photography (Todd's Dime Series No. 5). 1902. 10 cents.

Orthochromatic Photography. By James Cadett. Revised edition, 1901-2. Obtainable gratis from Cadett and Neal, Ltd., Ashted Surrey, England. A simple and valuable monograph.

Color Values in Monochrome. By John S. Plaskett. 1901. Obtainable from the author, University of Toronto, Toronto, Canada. A booklet of 45 pages, presenting the essentials of orthochromatic photography in clear and simple language.

The Scientific Requirements of Color Photography (Robert Boyle Lecture, 1897). By Sir W. deW. Abney. Published by Henry Frowde, London. Now out of print.

The Chemical Effects of the Spectrum. By Dr. J. M. Eder. 1884. 50 cents. Valuable despite its age.

Eder's Praxis der Photographie Mit Gelatine Emulsionen, just published (1902), presents some 40 pages on orthochromatic plates embodying recent progress.

Price, \$2.50 from Wilhelm Knapp, Halle a/s Germany

Notes

Upwards of 5,000 photographic post-cards were sent in to the Kodak Sensitized Post-card competition recently held in Great Britain. The prizes offered amounted to \$250 (£50). From this it is apparent that the vogue of the photographic post-card is greater on the other side of the Atlantic than on this side.



According to a writer in Eder's *Jahrbuch* for 1902, Bayer & Co., of Elberfeld, have discovered or worked out another new developer. It is called pyrophan, and is a condensation product of dimethylamin and pyrogallol, and has the formula $(\text{HO})_3 \text{NH} \cdot \text{CH}_3 \text{CH}_3$. It can be used like pyro, but gives quicker development than pyro, and will also develop in the presence of sulphite without an alkali. The new product has not yet been placed in the market.



Ilford, Limited, one of the largest photographic manufacturing firms in Great Britain, has issued its directors' report for the year ending October 31. The report states that, after payment of working expenses, directors' fees, income tax, etc., and making provision for doubtful debts, the net profit for the year's trading is £51,508 (about \$250,000). This amount, with £4,407 (\$21,374) brought forward from last year, gives £55,914 (\$271,183) for appropriation. The directors have paid an interim dividend on the ordinary share capital for the half-year ended April 30, 1902, at the rate of 8 per cent per annum, and for the same period they have paid the dividend on the preference shares. Since then the second dividend on the prefer-

ence shares has been paid. From the balance the directors recommend that on the ordinary share capital a dividend be paid for the half-year ended October 31, 1902, at the rate of 12 per cent per annum, and, in addition, a bonus of $2\frac{1}{2}$ per cent, making with the interim dividend a distribution of $12\frac{1}{2}$ per cent for the year. On the profit-sharing scheme, £843 (\$4,088) more or less will be paid as bonus to the employees. Of the balance, the directors recommend that £8,000 (\$38,800) be written off goodwill, processes, etc., that £9,000 (\$43,650) be placed to reserve, and £2,921 (\$14,163) carried forward.



The development of a waterfall scene, wherein the fall of water usually demands so brief an exposure of the plate that the details of the surrounding foliage and natural accessories are necessarily underexposed, is admittedly a difficult problem. An old photographer with a successful record in this sort of work suggests that the development of such a plate should be begun with a pyro developer, fairly strong in pyro, but with just enough alkali to make the pyro bring out the details of the waterfall. The pyro developer is then poured off and a metol developer of moderate strength applied to the plate. This procedure, averred the photographer in question, would give the waterfall and its surroundings with the desired amount of detail and contrast. Unfortunately this worker prepared his developers by rule of thumb, so that we cannot give definite formulæ.

The development of an interior view, showing a window looking out upon an open landscape, is an equally interesting problem. Mr. W. B. Kilbey, an English photographer, gives the following procedure as effective. His method involves a somewhat radical departure in calculating the exposure, but we publish it as likely to be of service to those undertaking interior photographing during the winter months when the problem of indoor illumination is more than ordinarily troublesome. In explaining his method, Mr. Kilbey said that his plan of estimating the exposure had never failed him even in very difficult cases. He stopped down the lens to the

smallest stop, and placed his head under the focusing cloth. Then the eyes were closed for about half a minute and opened again. The lens aperture was gradually opened until faint detail was seen in the deeper shadows of the subject. At that aperture, with a medium rapid plate, ten minutes' exposure was given. For example, if $f/16$ was the aperture by which faint detail was seen, then with $f/11$ an exposure would be five minutes, and with $f/22$ twenty minutes. In his remarks on development he gave the formula which he had found extremely valuable in cases: No. 1.—Pyro, 45 grains; metol, 40 grains; potass. metabisulphite, 90 grains; potass. bromide, 10 grains; water, 20 ounces. No. 2—Soda carbonate, 3 ounces; water, 20 ounces. No. 3—Bromide, 100 grains; sodium sulphite, 300 grains; water, 20 ounces.

Use 2 ounces of No. 1, and add 2 drams of No. 3. Add 1 dram of No. 2 every few minutes until the first signs of detail were observed; the plate should then be allowed to develop gradually. A photograph of the interior of a room was shown at the demonstration of this method. Though the sun shone through the windows, there was no sign of halation anywhere. The houses on the opposite side of the street and the texture of the thin India muslin curtains could be seen plainly. The correct exposure for the outside scene was $\frac{1}{10}$ second at $f/16$, and inside of room was 10 minutes at same aperture. Thus the outside view was overexposed 6,000 times.



The Ives Kromskop Company, of Philadelphia, has removed its principal office and manufacturing plant from that city to 550-552 West 25th street, New York. The sale of kromskops, Cadett spectrum plates and color photography supplies will be continued from this address in future; but the principal object of the company's removal to New York is to introduce trichromatic printing by improved methods, based on patents recently granted to Mr. Frederic E. Ives, who is the scientific expert of the company. In view of this new introduction, the title of the firm has been changed to

the Ives Process Company. The new organization owns some twenty patents granted to Mr. Ives, and controls the methods of Mons. Theo. Perrot, who was formerly connected with the Photochromogravure Company, of Lyons, France. We learn from an outside, but reliable source, that the Ives Process Company has established its methods of color reproduction on a strictly scientific basis, in which event we may look for process prints in color surpassing anything of the sort yet seen.



The Minneapolis Society of Fine Arts, in coöperation with the Minneapolis Camera Club, announces that the first Minneapolis Photographic Salon will be held in the Art Gallery of the Public Library, Minneapolis, from January 17 to January 28, 1903. Exhibitors at the Chicago Salon, closing about January 4, will be invited to send their work to the Minneapolis Salon, and, together with local and other exhibits, a most successful exhibition is anticipated.

The Jury of Selection will consist of Mr. Robert Koehler, Mr. Alexis J. Fournier, of the Society of Fine Arts, and Mr. A. E. Murdock, president of the Camera Club. No charge will be made to exhibitors and no awards are offered, but the acceptance of work by the Jury of Selection will be an honor of no small degree when its personnel is considered.

A pamphlet containing full particulars and rules for exhibitors, together with entry blanks, may be had by addressing Mr. C. F. Potter, Jr., 13 South Seventh street, Minneapolis, Minn.

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AMERICAN PICTORIAL PHOTOGRAPHY. Representative examples of the work of the American School of Pictorial Photography. Selected by and reproduced in photogravure under the personal supervision of ALFRED STIEGLITZ, and formerly published by "Camera Notes." Series I, *net*, \$15. Series II, *net*, \$8. The edition was limited to 150 copies of each series, and only a few sets are obtainable. Descriptive circular on request.

THE "CAMERA NOTES" IMPROVED GLYCERINE PROCESS for the development of platinum prints, including the experiments of ALFRED STIEGLITZ and JOSEPH T. KEILEY. Illustrated with facsimile reproductions in color, by the experimenters. Reprinted from "Camera Notes." Only a few copies obtainable. Paper covers, *net*, \$1.

AN INDEX OF STANDARD PHOTOGRAMS. Being a guide for Authors, Editors and Publishers of Illustrated Books and Periodicals, Collectors of Pictures, etc., listing photographs available for publication purposes. Sold by subscription only. Particulars on request.

PHOTOGRAPHY FOR NATURALISTS. By DOUGLAS ENGLISH. A book for those interested in photographing animals, etc. 132 pp., fully illustrated. \$2.50.

PRACTICAL NOTES ON TELEPHOTOGRAPHY. By BECK LTD. A pocket-book of practical information. Cloth, 25 cents.

THE A B C OF PHOTO-MICROGRAPHY. A practical handbook for beginners, by W. H. WALMSEY. With plain instructions and many engravings. 155 pp.; 28 illustrations. Cloth, *net*, \$1.25.

PHOTOGRAPHIC APPARATUS, its making and repairing, by various English writers. 128 pp.; many diagrams. Cloth, *net*, \$1.

FINISHING THE NEGATIVE. An encyclopedic treatise on all the processes between development and printing. Edited by GEORGE E. BROWN. 160 pp.; profusely illustrated. Cloth, *net*, \$1.25.

THE LENS. A practical guide to the choice, use and testing of photographic objectives. By GEORGE E. BROWN and THOMAS BOLAS. Profusely illustrated. 176 pp. Cloth, *net*, \$1.25.

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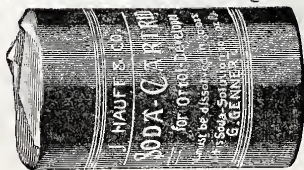
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The Kodak Developing Machine is winning its way. The photographic public was slow to believe. It could not throw down at once the traditions of a half century because of the claims we made for the machine. It demanded demonstration. Our claims were as hard to believe as were those made for the X-Ray and the Marconi telegraph. But wherever the machine is demonstrated it makes strong friends. We ask that you make it a point to "see how it works" at the first opportunity. We are confident that your skepticism, like that of Mr. Pettus, will be annihilated.

TOOK TIME AND SNAPS

MANCELONA, MICH., Oct. 26, 1902.

I have had several years' experience with Pocket Kodak films, but believe I never finished such a clear-cut, well-developed set of negatives as resulted from my first trial of the machine. Three exposures were made with bright sun on the water, and three were time exposures made indoors on a cloudy day. The simple, cleanly operation with such results is certainly highly pleasing. I am delighted and think the machine a bargain.

Very truly yours,

ROBERT C. WENTE.

SKEPTICISM ANNIHILATED

BROOKLYN, Oct. 16, 1902.

EASTMAN KODAK CO., Rochester, N. Y.

Among the skeptics I was numbered until your representative annihilated my skepticism, and made my amateur life easy, through the practical workings of your model Developing Machine.

On return from a recent trip from the Newfoundland coast, with its fogs and rain: I used nine rolls of film—87 exposures in all, was in doubt as to whom I should have develop them. I went to Messrs. Kiffes, on Fulton street, Brooklyn, and there met your representative, giving a public demonstration. He coaxed me to let him try one of my films. I reluctantly consented; the result was clear, clean and entirely perfect negatives. Delighted, I had him agree to give a private demonstration at my home, for the benefit of many newspaper and professional friends. All the rest of my films were there developed and were perfect—not a single failure. Truly marvelous when it is considered that all these exposures were made on cloudy, rainy and foggy days.

It is needless to say that three machines were ordered of the larger size, of one of which I am the happy possessor. Yours,

EDW. PETTUS.

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We are widening the field of the Kodak Developing Machine as rapidly as possible. The latest is the Brownie Developing Machine. This simple little machine is for use with Brownie Cartridges of either size, and requires but 8 ounces of developer. It is practically a miniature of the other machines except that, the Brownie Cartridges being all of the same length, we are enabled to use a simpler spool-carrying device. The price of the machine is but \$2.00, and the cost of both developing and fixing powders for a roll of film is less than five cents. An entire Brownie outfit, with everything that you need for turning out $2\frac{1}{4} \times 3\frac{1}{4}$ pictures, *without a dark-room*, may now be obtained of any dealer for five dollars, including the price of the camera. You, Mr. Reader, being a subscriber to a photographic magazine, no doubt have an elaborate outfit yourself, but you may have some boy or girl—or older person, for that matter—on your Birthday list, who would be delighted at being set up in the kind of photography that requires no dark-room. We think that you'd become interested yourself.

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Brownie Developing Machine Outfit	75
Brownie Developing Machine Developer Powders, per pkg. of $\frac{1}{2}$ doz. (Each powder makes 8 ounces of developer)	15
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There's something about the lighting of most flash-light pictures that seems harsh—that grates a little on one's artistic sense. It's on account of the sharply defined shadow lines. With the ordinary flash, the source of light is so restricted that shadows are almost as sharply defined as those thrown by an electric light, but fortunately this difficulty has been overcome by the Eastman Spreader Flash Cartridge. These cartridges, by the wide spread of light they give, enable the amateur to illuminate the subject as softly as though he were using a north window. They consist of round wooden boxes with paste-board tops which are held in the center by a single tack. This serves the double purpose of keeping the powder from sifting about and of spreading the light when the cartridge is discharged. These cartridges may be discharged with a fuse, with which each one is equipped, or the fuse may be pulled out and thrown away and the fuse hole

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screwed over the nipple of an Eastman Spreader Flash Cartridge Pistol, and the cartridge ignited by means of a paper cap. (Each box of $\frac{1}{2}$ doz. cartridges will contain a package of paper caps.) The pistols are simple and convenient in use, and are a distinct advantage in those cases where one wishes to fire the cartridge at an opportune moment—when the sitter assumes a pleasing pose, for instance.

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Something about the aims and methods of the Kodak Correspondence School of Photography

The remarkable successes which have been scored by several of the correspondence schools have resulted in hundreds of these institutions springing up the country over. Some of these are good, are practical, and give full value to the pupil. Others depend upon extravagant promises, and offer to give schooling in subjects which it is obvious cannot be satisfactorily taught by mail. Most of them hold out to the pupil the prospect of increasing his earning capacity by the knowledge which they give him. In this, the Kodak Correspondence School of Photography differs from the others. It offers to increase your enjoyment of a favorite hobby — photography. If there is one subject which can be more readily taught by mail than any other, it is photography. An expert, and we employ only experts in our school, can, in nearly every instance, tell from the look of a defective negative or print just where the trouble lies. He can make his advice invaluable to the amateur who is striving to improve his work. The text-books which we furnish are written in a non-technical manner which any one can understand, and they carry the amateur through every step, from pressing the button to lantern-slide making and enlarging. Special instructions, including individual criticism of the work submitted, will be given in Exposure and Development, Printing-Out Papers, Development Papers, Outdoor Photography, Portraiture and Interiors, Platinum Printing, Bromide Enlarging and Lantern-Slide Making.

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following special articles: "Platinum Printing," by Alfred Stieglitz; "The Sensitizing and Use of Plain Papers," by Bernard Alferi; "Carbon Printing," by James A. Sinclair; and "The Gum Bichromate Process," by Robert Demachy.

Tuition is free to all owners of Kodak and Brownie cameras upon payment of one dollar for text-books. We could not afford to give the course for less than five times this sum were it not for the fact that we expect to reap our benefit from the increased interest in photography that is sure to come with an improvement in the quality of work turned out by our pupils. The dollar which we charge will not cover the cost of books and postage—to say nothing of the salaries of our instructors.

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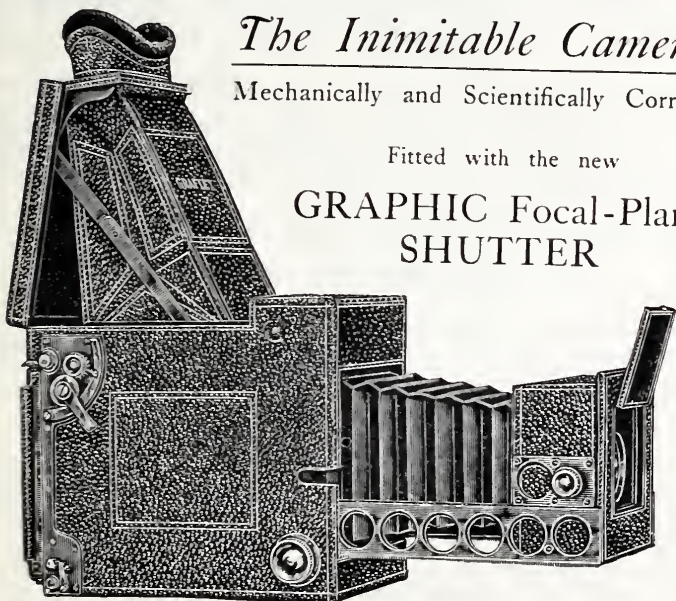
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NO. 2		NO. 2	
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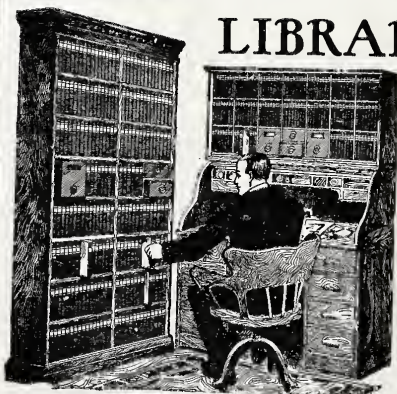
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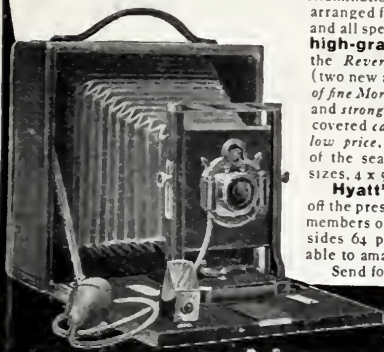
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EDITED BY JOHN A. TENNANT

Volume IV

JANUARY, 1903

Number 45

DEVELOPMENT PRINTING PAPERS

I have waited long and patiently for somebody else to give us this little book, or, rather, to publish one which would leave no room for this—for various reasons. My experience in printing by development has been largely confined to the products of a single manufacturer. Other and later products from other manufacturers have been given trial as they appeared; but I have invariably returned to the old favorites, not so much because the old seemed better than the new, or the newer papers less desirable than the old, but simply because all printing papers have peculiarities and I knew more about the earlier product. Moreover, its different varieties filled my every need. It is no crime to be contented with the old order, although it may unfit one to be the herald and prophet of the new. And there is the old counsel against being tossed about by every wind of doctrine. These and similar scruples seemed to urge that the book of development papers should be written by another. I have waited in vain. As with film photography, so with development printing papers, the world seems to wait for THE PHOTO-MINIATURE!

Few innovations in photography have proved themselves so vitally important to its growth, have added so largely to its following, or so quickly won such world-wide favor as these two—roll films and development papers. The history of photography during these last few years is more intimately concerned with them than with all other inventions combined. We are only begin-

ning to realize how completely they have revolutionized its practice. Surely we should have had an interesting book about them long ago. And yet, outside THE PHOTO-MINIATURE series, little or no attempt has been made to sift and arrange what a thousand workers have recorded on as many scattered pages concerning their manifold uses, advantages and peculiarities. The story of film photography was told in THE PHOTO-MINIATURE No. 37. In the following pages I propose to gather together all the available information about development papers and their successful manipulation. The largest and most interesting portion of the monograph embodies the ripe experience of Mr. William Perry Hopkins, and grateful acknowledgment of his help is here made.

What do we mean by development printing papers? Properly speaking, all printing papers which give the picture image by development after exposure to light (as distinct from those which yield a visible printed-out image by exposure alone) are development papers. In this broad sense, carbon, platinum, ordinary rapid bromide paper and certain papers prepared with the light-sensitive salts of silver and iron are development papers. But we are not concerned with these at present. The scope of this monograph includes only the so-called "slow bromide" papers (of which Velox is a prominent example), the distinctive feature of which is that they can safely be manipulated in weak daylight or gaslight, no "dark-room" or ruby light being necessary in their use.

Because of this peculiarity such papers are commonly called "gaslight" papers. But they are just as truly daylight, electric light and lamplight papers. Hence the difficulty in finding a properly descriptive title for this monograph. If it could have been headed "Velox Papers," its significance would have been plain even to the novice in photography. Its purpose, however, is not to advertise Velox, but to serve as a handbook to all the papers of this class, of which Velox was the pioneer and among which it holds (and justly holds) the chief place today. Further, since the advent of "gaslight" papers has drawn attention to printing by development,

as a method peculiarly suited to the photographic requirements of today and tomorrow, the broader title seemed to indicate more correctly the scope and intention of the work proposed.

The origin of development papers, as we now know them, dates back less than ten years. In 1895 the American photographer, having practically abandoned the use of albumen paper, was experimenting with a host of collodion and gelatine-chloride papers. These called for scrupulous care in manipulation, and the results, apart from their uncertainty, were not always satisfactory. The spirit of unrest was abroad. Every week brought forth a new printing paper, and every new paper claimed to be perfection. The photographer found disadvantages in all, but there was a general determination not to "go back to old albumen," with its slavery to conditions of weather and tedious manipulation. Among the new papers of this period came one called *Velox* (a Latin word, meaning swift, quick), which claimed to be "500 times quicker than albumen," independent of daylight and weather, and giving prints equal to the best made on albumen paper. This *Velox* came from the Nepera Chemical Company, of Nepera Park, N. Y., and was, I believe, the invention of the company's chemist, Dr. Leo Baekeland.

The first *Velox* paper was very similar to the glossy bromide paper of today, coated on baryta paper, with a faint pink tint, and it gave prints approximately resembling the familiar purple-brown albumen prints of that time. Its novelty lay in the fact that (unlike bromide paper) it could safely be handled in subdued daylight or weak gaslight before exposure and during development. The photographer could fill his printing frames in the quiet light of his printing- or toning-rooms, expose the paper to daylight or to a convenient gas-jet for a few seconds, and develop the print at once, without the difficulties attending the making of prints by ruby lamplight. It was wonderful! The possibilities of the new paper were quickly appreciated; the amateur perceived that with *Velox* he could make his prints at night (or at his

convenience) by his own fireside, with a minimum expenditure of time and labor; modified emulsions for "black tones" on matt paper, and other varieties of surface and finish were introduced. The success of Velox was assured. Within a year or two after its first appearance it was well known to amateurs and professionals all the world over. The manufacturers of similar products were not slow to grasp the commercial possibilities opened up by the use of "gaslight" papers. Numerous imitations (the word is used without prejudice, all later papers closely resembling Velox in general characteristics, varieties, etc.) began to appear, until today we have a dozen development papers from as many different manufacturers.

"Gaslight" Emulsions How are "gaslight" papers made? Very briefly, they consist of a slow, gelatine chloro-bromide of silver emulsion coated on many different kinds of paper. This emulsion, which is slightly modified according to the qualities desired in this or that brand of paper, is much less sensitive to light than the emulsion used in the manufacture of "dry plates," but is capable of giving a developable image when properly exposed to light behind a negative—as to daylight, gaslight, etc. The paper stock used in preparing such papers varies in weight, color, texture and surface finish according to the use for which different varieties are designed. In other words, "gaslight" papers are simply modified bromide papers. Hence, despite all the broad claims about their being handled in "full gaslight," etc., they should be treated with the same care one would give to a very slow plate, being liable to fog if this detail is neglected. Their preparation is beyond the skill and facilities of the average photographer and need not be dealt with here. Among the commercial varieties the reader will find a wide range of different emulsions and papers, excellent in quality, and meeting every requirement at a reasonable cost.

Comparisons How do "gaslight" papers compare in manipulation and results with other printing papers? There are those who think that the proper way to describe their favorite

printing paper is to decry all other papers and enlarge upon the incontestable superiority of the kind they use. We do not follow this method in THE PHOTO-MINIATURE. All printing papers have their advantages and disadvantages; all require care and intelligence in manipulation; all give results pleasing to different tastes. I have seen prints, from the same negative, on carbon, platinum and Velox papers. The Velox print was quite as desirable as either of the other two, as rich in its gradations and as delicious in the depth of its shadows. But the test proved nothing. The negative was clearly an exception to the general run of negatives and the printer was an enthusiast as skilful in Velox printing as he was enthusiastic. We must be fair. A curious commentary on the test was furnished later, when I had a half-tone reproduction made from the Velox print. A fine screen was used and the block was carefully printed. The prints were quite as desirable as either the original carbon, platinum or Velox prints!

Of course, it may be said, with truth, that carbon printing is messy and tedious, and that platinum paper is expensive and has a shorter range of tones than Velox. Also there may be murmurings of "bichromate disease" and the troubles incidental to the use of mercuric chloride. But nothing can surpass the subtle beauty of a good platinotype, or the rare delicacy of a good carbon print; and these qualities amply compensate for minor disadvantages. It is the end that tells. All of which is said without prejudice for or against Velox or development papers. The practical conclusion of the whole matter is, that development papers offer a very simple and convenient means of producing beautiful prints, at any time and in any place; a wonderful variety of emulsions suited for different kinds of negatives and purposes, are economical in manipulation and, for a great many uses, all that the heart of man can desire.

What about uniformity and keeping
 Keeping qualities in development papers? As
 Qualities with plates, so with papers; uniformity
 in quality of product depends upon the manufacturer.
 I can speak for the uniformity of Velox papers; with

others I simply lack that continued experience necessary for an opinion. It is, however, reasonable to expect a slow emulsion paper to retain its efficiency for a considerable period, knowing, as we do, that plates lose their efficiency more or less quickly according to their sensitiveness or rapidity. There is abundant testimony that Velox papers keep their printing qualities unimpaired for a year or more. The same has been said for Cyko and Vinco. The advantages are obvious: one runs no risk of losing paper when a few sheets from a full package suffice for one printing, and there is no need to think about a fresh supply of paper for each printing. For my own part I keep a generous stock of all varieties of Velox on hand, using from this or that variety according to my needs or as leisure permits regardless of the age of the paper. If there had been deterioration this method of use would have brought it to my attention.

Are prints made on "gaslight"

Permanency papers permanent? The question is often asked but is difficult to answer. In theory, a silver print made by development bears an image of metallic silver and, if properly fixed and washed, should be absolutely permanent. Hence manufacturers are unanimous in claiming permanency for prints made on their papers. But the claim is not justified by facts, for, despite both theory and claim, we have all seen "gaslight" prints fade most abominably. It is true that the fault can generally be traced to careless manipulation, but that evades the point at issue. The average man says: It is admitted that carbon and platinum prints are permanent (do not change and grow unsightly) when made with ordinary care. Will the same ordinary care give me equally permanent prints with "gaslight" papers? The fairest answer to this, going by facts and experience, is bound to be unsatisfactory. The permanency of any silver print depends largely upon the care and thoroughness given to its making; given absolute care throughout, it should be absolutely permanent; given reasonable care throughout, it will be reasonably permanent. I have Velox prints made five years ago by the manufacturers

of the paper and others of my own making; some are terribly faded; others are as fresh and as desirable as when first made. This experience is general. Facts are stubborn things. The permanency of any print produced by chemical processes must always depend upon the man behind the print as well as upon his materials. It is, however, unquestionable that, with a reasonable amount of care in manipulation, prints made on development papers will retain their qualities quite as long as is desirable—say twenty years.

The normal print on development paper closely resembles the familiar platinotype. The tones range from a rich blue-black, velvety jet black or brown olive-black, through an infinite gradation of grays to the pure white of the baryta base or the tint of the paper support bearing the emulsion. Given a reasonably good negative, the half-tones throughout this range of shades are clear and rich in detail. With the possible exception of carbon, development prints are unequaled in their wonderful range of tone gradation and in their capacity for reproducing minute detail. Unlike many printing papers, the general tone or color of a "gaslight" print depends less upon the character of the negative than upon certain modifications in exposure and development. As a consequence of this, we can, by uniformity in these two details, produce any number of prints from a negative, all absolutely uniform in appearance.

The variety of colors obtainable with "gaslight" papers opens up a wide field for experiment. We will take this under consideration later. It is sufficient at present to know that we can obtain "gaslight" prints in many reds, browns, sepias, greens and blues, apart from the normal blacks and grays. In some cases these colored prints are obtained by variations in exposure, developer or development; in others by "toning" or intensifying methods. We must not forget that these changes belong to the field of experiment and the results are uncertain. The permanency of such prints is equally uncertain, but their production offers interesting possibilities, which should not be wholly neglected.

Commercial Papers We now have a general knowledge of development papers, what they are and how they differ from other printing papers. Let us take up another characteristic peculiar to this class of papers; viz., their remarkable variety, by which they are adapted to give the best possible results with all kinds of negatives. The importance of this feature cannot be overestimated. In all other printing methods it is essential to success that the negative shall be suited to the paper used in making the print. Thus negatives made to be printed in carbon must have certain qualities. The same is true in platinotype, albumen, print-out and other processes. In the use of development papers we can take any negative and get just the kind of print we desire by intelligent choice among the many varieties of paper obtainable. A moment's consideration of the variations commonly found in the photographer's negatives, variations due to numberless irregularities in circumstances, conditions and technique, will show us the immense advantage here offered. For this intelligent choice and use of development papers, however, we must be familiar with the commercial brands and their varieties. To this end we will review, very briefly, the different papers in the market. In this review the reader should remember that Velox was the first development paper to be introduced, and that it was perfected in many varieties before any of its now numerous following appeared. This will explain the similarity in general characteristics among the papers of different manufacturers, and will also save me much needless repetition in description. First, then, in the American market, we have:

Velox This is made in nine varieties, broadly divided into two kinds of emulsions, known as "Regular" and "Special" papers. These terms simply refer to the time required by the papers of each class for exposure and development. "Regular" papers are a little slower than "Special" papers in exposure, but they develop more quickly. For this reason they are, as a class, adapted for use with thin negatives lacking in contrast. "Spe-

cial" papers, on the other hand, require a shorter exposure than "Regular" papers, and develop more slowly. This tends to reduce contrast in the print. They are, therefore, adapted for use with strong or "hard" negatives, or wherever soft effects with detail are desired in the print. Both "Regular" and "Special" papers are obtainable in several varieties of weight and surface finish.

For reasons already given, and also because Velox is, without doubt, the development paper most widely known and used, the different varieties of Velox will be shortly described. Other papers will be treated with greater brevity, not as less worthy of attention, but simply because they are, for the most part, modeled on Velox papers, and a detailed description would involve endless repetition. Where differences of moment exist, these will be mentioned. Taking up the "Regular" Velox papers first, we have:

Carbon Velox This, the most popular of Velox varieties, is especially adapted for negatives that have a lack of contrast, and in the majority of instances will make a better print from such negatives than can be obtained on any other variety. The surface is a smooth matt.

Rough Velox This has the same characteristics as Carbon in its printing qualities, but it has a rougher surface. It is especially adapted to large negatives and to those where broad effects are desired.

Glossy Velox This is especially designed for use where fine details are desired, as for reproduction purposes, technical and photo-micrographic work. It produces prints which can be squeegeed, or burnished to a very high polish.

The assortment of "Special" Velox papers is larger, and comprises the following:

Special Carbon This has the same surface as the Regular Carbon, but, having the quicker printing qualities of all the special papers, it is adapted to negatives which do not need to have their contrast increased. It is especially suited to pyro-developed or dense negatives.

Special Portrait This paper, like the Special Carbon, is for negatives that have enough, or too much contrast, and will yield soft results from hard negatives. Its surface is half matt, which adapts it particularly to portrait work, hence its name of Special Portrait. It is also widely used in making prints for reproduction.

Special Rough This is for pictorial work, but its surface will usually be found rather rough for very small negatives, or for those where the print must have extreme accuracy of lines and details. The shadows have a deep, velvety black, while the half-tones are very correct and pleasing. This paper is adapted to the same kind of negatives as the Special Portrait and Special Carbon, but it gives broader effects and less detail.

Special Glossy The characteristics of this paper are the same as the regular Glossy, excepting in the time required for printing and developing, which adapt it to a different kind of negatives, as already explained.

Special Rough, Double Weight This has the same qualities as Special Rough, as far as its printing features are concerned; but in consequence of its extra weight, combined with its rough surface, it requires no mount and should be printed under a cut-out, which will insure a white margin, relieving the print and giving the effect of a mounted photograph for book illustration, etc.

Velox Postal Cards These are made from stock of the same weight as the Special Rough, have the same printing characteristics and require the same handling, but the surface is a smooth matt, like the Carbon.

A point worth remembering in the use of Velox papers is that the "Special" papers need only one-fourth the exposure required by the "Regular" papers, but take twice as long to develop.

Cyko This product, which is fast winning popularity by its attractive quality, is made in seven varieties. These so closely resemble the varieties of Velox that the manu-

facturers' description of them [Cyko Manual] is practically identical with the detailed description of Velox papers given above [Velox Manual]. The Cyko series is divided into two grades, known as "Slow" and "Quick," respectively equivalent to the "Regular" and "Special" grades of Velox. Similarly, in taking up the varieties in each class, for the characteristics of *Carbon Cyko*, see the description given of *Carbon Velox*; for *Rough Cyko*, see *Rough Velox*; for *Glossy Cyko*, see *Glossy Velox*. In the "Quick" class, corresponding to "Special" Velox; for *Portrait Smooth Cyko*, see the description of *Special Portrait Velox*; for *Portrait Rough Cyko*, see *Special Rough Velox*; and for *Portrait Glossy Cyko*, see *Special Glossy Velox*. In place of *Special Rough*, *Double Weight Velox* we have *Art Cyko* with the same characteristics and intended for the same uses. Thus the Cyko series practically duplicates the Velox series, except that *Special Carbon Velox* and *Velox Postcards* are omitted.

It should be noted that "Quick," or Portrait Cyko papers differ from those of the "Slow" grade, in that they print in one-quarter of the time required for the latter, but require *four times* as long in development.

This was one of the earliest gaslight papers to appear after the introduction of Velox. It is made in four varieties, as follows: *Carbon Matte*, with a finely-grained, velvety surface, cream-tinted; *Plain Matte*, white, with a natural paper texture; *Egg-shell Matte*, a white paper of medium weight, with an irregularly grained surface; and *Rough Matte*, white, with a rough surface. The difference between the Dekko varieties is wholly in their surface finish.

This paper, made in Germany, is widely used by American and English photographers. It was formerly marketed under the name *Lenta*, and in England it is known as *Rotokon*. There are nine varieties of Rotox, all having the same general rapidity as far as I can discover, but differing widely in weight, color and surface finish. The Rotox series is divided into three classes, as follows: *Glossy Rotox*: 1—Thin (rose-tinted); 2—Thin,

pensee (a delicate mauve tint). *Matt Smooth Rotox*: 3—Thin; 4—Thick; 7—Half matt, thin. *Rough Rotox*: 5—Thick, cream-tinted; 6—Thin, white; 8—Thick, white. *Rotox Postcards* are a separate variety.

These are grouped together as the product of one factory. I am not sure that I can accurately describe them as they are today, a request to the manufacturer bringing no information. Briefly, *Vinco* is described as a "platino-bromide" paper obtainable in six varieties. Three of these are apparently "Slow," viz.: *Smooth Matt*, *Rough* and *Glossy Vinco*, designed purely for contact printing, i. e., not sufficiently rapid for enlarging purposes. The other three resemble the "Special" grade of Velox and are respectively: *Special Rapid Smooth*, *Special Rapid Carbon*, and *Special Rapid Rough Vinco*, these being adapted for portrait work and enlargements. *National Vinco* is a thick paper with a solid cream tint for broad or pictorial effects. *Gravura Vinco* is a grained surface paper (with fine crossed lines), giving prints marked by peculiar softness and relief. This, with No. 5 of the *Rotox* series, is a distinct departure from the Velox series. Note that *Gravura Vinco* is a purely American product as far as the emulsion is concerned. It should not be confused with the earlier English *Gravura* (Paget) of the same class, but lacking the surface finish of *Gravura Vinco*.

This is a western product obtainable in three varieties: *Matt*, *Gloss* and *Special Portrait Kruxo*, resembling the Velox varieties of these kinds. My limited experience with *Kruxo* indicated that it is generally less rapid than "Special Velox."

A development paper of standard quality, popular in the south where it is marketed. It is made in four varieties: two "quick" papers, *Portrait Smooth* and *Portrait Rough*, similar to "Portrait Cyko;" and two "slow" papers, *Carbon Matte* and *Carbon Rough*. A peculiar feature of Dixie "slow" varieties is that they require *ten times* the exposure needed for the "quick" varieties, and the development is gradual.

This is a Rochester, N. Y., product made in ten varieties, very similar to Cyko and Velox, but divided into three classes, as follows: For soft negatives lacking in contrast—1. *Carbon Argo Matte*; 2. *C. A. Gloss*; 3. *C. A. Rough*; 4. *C. A. Cardboard*. For negatives with sufficient contrast—5. *Portrait Argo Matte*; 6. *P. A. Gloss*; 7. *P. A. Rough*; 8. *P. A. Cardboard*. For unusually hard or strong negatives two special varieties are provided—9. *Special Portrait Argo Matte*, and 10. *S. P. A. Gloss*.

Another Rochester paper well-spoken of is *Platina*, made in two varieties, "Smooth Matte" for portrait work and "Medium Smooth" for general view work. It is said to have good keeping qualities and will not fog from overdevelopment. The latter feature is not readily understood, as all emulsions fog if subjected to developing (reducing) solutions for too extended a period.

The British market is quite as well supplied as our own market with different gaslight papers, but offers no marked variation from the Velox series. For some years *Velox* had the English market to itself, and it is still the paper most generally used on "the other side." It is, of course, identical with the American product, being made here and exported. *Rotokon*, as already mentioned, is identical with what we know as *Rotox*. In England it is marketed in six varieties only. The English varieties of *Dekko* are of home manufacture and differ slightly from the American product, although similar in name.

Among development papers of English manufacture the following are most in favor: *Wellington S. C. P.* (*Slow Contact Paper*, not intended for enlargements). This is obtainable in four varieties: *Smooth Matt* and *Glossy* (also made in heavier weights); also *Art S. C. P.*, white and tinted. The Wellington papers are noted for their fine qualities, but are generally slower than the standard American papers. *Ilford Gaslight Papers*, a comparatively new product, are at present obtainable in two varieties only, *Thin* for ordinary purposes, and

Heavy Thick for postcards and commercial uses where mounting is undesirable, etc. *Paget Gravura* is an English paper much favored by discriminating workers. It is made in two grades, "ordinary" and "special," the latter lending itself readily to the production of prints in a variety of desirable colors from engraving black to a brilliant red chalk. Each class contains three varieties, viz.: *Glossy*, *Matt* and *Rough*, differing in surface finish only.

Marion's *Quick Print* paper, made in three varieties only: *Glossy*, *Matt* and *Rough*, completes the British list as far as my information goes. *Quick Print* papers are adapted for use with soft, detailful negatives.

Standards for Comparison Having now a sufficient knowledge of the varieties available among commercial development papers, the reader who has stumbled through this bewildering list is ready to ask: Can you not give us some sort of a guide to a closer comparison among papers of the same kind offered by different makers? This can be obtained only by experience. The simplest way is to familiarize oneself with all the varieties obtainable from one maker, and thus obtain standards for intelligent comparison. This is the plan we will follow here, taking the *Velox* series as embracing almost all varieties. If I can enable the reader to grasp the possibilities of *Velox*, he will find no difficulty in appreciating the practical qualities offered in other papers. At the same time, the differences between the various products are unimportant and largely matters of personal opinion, so that the instructions here given may safely be followed in the manipulation of all "gaslight" papers.

I have said that development papers, by their endless variety, are adapted to give the best possible results from all sorts of negatives. Taking up the *Velox* series from this viewpoint, we can simplify things by remembering that:

Glossy Velox renders fine details and hairlines with great precision.

Carbon Velox offers a very finely grained matt surface suitable for every-day effects and uses, giving a reasonable amount of detail, without excess.

Rough Velox gives broad and sketchy effects, unobtainable on the smoother papers, because of the coarser grained surface on which the emulsion is coated.

For portraits, where we want roundness in modelling and brilliancy of tone without obtrusive detail, there is *Special Portrait Velox*; the surface of which is midway between the very smooth finish of glossy Velox and the dull matt of the carbon varieties.

Going a step further, we remember
 A Basis for Selection that each of the three kinds—*Glossy, Carbon and Rough Velox*—can be obtained in either a “Regular” emulsion (which will slightly increase the contrasts seen in our negative), or in a “Special” emulsion similar to *Special Portrait Velox* (giving more detail than the “Regular” emulsion and softer effects in our prints). By making prints from the same negative, first on “Regular” and then on “Special” Velox, we can demonstrate these comparative effects for ourselves. In the first print the contrasts of the negative will be emphasized slightly; in the second print there will be an increased rendering of fine detail and the contrasts will be reduced or softened. Hence it follows that a negative slightly underexposed or underdeveloped, or both, and therefore lacking in contrast throughout its gradations, should be printed on one of the “Regular” varieties of Velox. By this means its deficiencies will be made less apparent. If, on the other hand, we have a fully exposed and fully developed negative, with plenty of density and full contrasts, a more pleasing print can be had on one of the “Special” papers. The distinction here drawn is easy to remember. It is the keynote to the successful use of all “gaslight” papers which offer two grades of emulsion. It enables us to fit the paper to the negative and so to obtain a good print from any sort of negative. Finally this method of comparison can be applied to other papers just as we have applied it to Velox.

I will illustrate this selection more fully. For general usefulness the preference falls to *Special Carbon Velox*, because it has the merit of giving a reasonable amount of detail with desirable softness in the print. For

average use with the average amateur's negatives—often undertimed and generally underdeveloped,—the “Regular” *Carbon Velox* is indicated. For pictorial effects where broad masses are preferable to details, I would suggest *Special Rough Velox* as emphasizing the effects obtained with *Special Carbon*, but, because of its rougher surface, giving less detail to distract the attention from the masses which make the composition attractive. Where additional breadth and contrast are desirable the “Regular” *Rough Velox* will fulfil the requirements.

Special Portrait Velox is a class in itself. For photographs of machinery, street scenes or any subject where detail is important and yet must not be too insistent, this variety is unequaled. It is especially desirable for use with orthochromatic plates, or negatives fully exposed and well carried through in development, exhibiting full gradation of tones and the right amount of contrast.

These, of course, are only suggestions. A little experience with different negatives and different papers will quickly give the reader an intelligent grasp of the chances to help his negatives, remedying their deficiencies and accentuating their good qualities.

The actual making of development prints is very simple. Those who have never attempted the work should purchase two or three packets of *Velox*, choosing the varieties best suited to their negatives on the information already given, a few tubes of M Q (Metol hydroquinone) developing powders, and a package of Nepera Acid-Hypo. The developer and hypo powders are first dissolved and bottled ready for use. When ready for printing at night, the paper, negatives, a printing frame, developing and fixing solutions and three trays are put ready, convenient to the water supply. The hypo (or fixing) solution is put in one of the trays, which should be kept for this purpose only. A second tray is filled with clean water and placed on the right-hand side of the fixing bath. The third tray is reserved for the developer, the bottle containing this and a graduate being placed together at the extreme right hand. Now turn



PORTRAIT OF MISS L.
Alvin Langdon Coburn
Fellow of the Photo Secession



ELY CATHEDRAL
Alvin Langdon Coburn
Fellow of the Photo Secession

the gas half down and, shielding the paper from direct light, take a piece of Velox from its package and put it behind the negative in the printing frame in the usual way. Close the printing frame, turn the gas on full, and hold the printing frame parallel with the broadside of the gas flame at a distance of six or seven inches for one minute (with *Carbon Velox*). See that the light strikes squarely on the negative during this exposure. Now turn the gas half-way down again, remove the paper from the printing frame and place it, film side uppermost, in the developing tray. Flood it with sufficient clean water to cover it. Here it will become thoroughly wetted and limp, while 2 ounces of developing solution are poured into the graduate. Now pour the water off the print (which thus far shows no image) and pour the developer on quickly so as to completely cover the print with an even sweep. If the exposure has been approximately correct the picture image will appear in ten seconds or so, and development will be completed in thirty or forty seconds. As soon as the print is dark enough, quickly transfer it to the second tray of clean water to remove the superfluous developer, and then immerse it in the fixing-bath, where it should be kept moving for a minute or two. Here it remains ten or fifteen minutes, after which it should be well washed in several changes of water. It is all very much simpler than even this brief instruction indicates, and we can see what we are doing all the time. Of course, there are difficulties in handling different negatives, in judging exposure, and endless modifications; but the making of the first dozen prints will suffice to show how simple gaslight printing is, and to give abundant reasons for its popularity with photographers of all classes. After a little practice one can produce a dozen perfect prints per hour, working leisurely. Expert workers, handling gaslight papers day by day in commercial photography, can turn out hundreds of prints per day. But for this we must first be masters of manipulation.

The first few prints, made by the novice ever so carefully, will probably be failures—harsh, or gray, or flat, or stained. This need not discourage. They were

made simply to show the simplicity of the process, and the experience was well worth what it cost. As a method, gaslight printing is simplicity itself. But to turn out good prints on different papers from different negatives we need a larger knowledge of manipulation. When this is gained it is just as simple to make good prints as to produce indifferent prints.

Let us begin again, this time more warily. First, we must master the working instructions issued with the paper. Next we must faithfully follow these instructions, using every care until we get fairly satisfactory prints. This necessarily slow traveling will tell us that very little variations in exposure make big differences in results; that the condition of the developing solution (its strength, its composition if we prepare it ourselves from the raw materials, and the number of prints it has developed, the amount of bromide it contains, and so on) has a corresponding influence on the character of the print. We will also learn that gaslight papers are more sensitive to light than we had supposed and that we cannot handle them carelessly in a strong light, even at some distance from it, without dire results. This applies especially to "Special" or "Quick" varieties of paper. The rapidity of different brands, even though they bear similar labels, will be found to vary largely; and this can only be adjusted by patience and experience—trial and error. With some papers, again, the coated (sensitive) side of the paper is not easily recognized. If we remember that the coated side usually curls inward when the sheet is held on the open palm of the hand we can avoid trouble from this source.

We have to deal with two lights or
Illuminants illuminants in making prints or gaslight papers. First there is the light we work with and then the light used for the exposure of the paper; both deserve attention. The working light should be sufficient for comfortable working, no more, and thoroughly safe, i. e., not strong enough to fog the paper during manipulation. Whether we work in daylight or at night by artificial light, care should be taken not to freely expose the sensitive paper too near the light provided for working, or too long to any light.

The clearness and brilliancy of our prints depends upon this in part. If we work by daylight, the window shades should be pulled down. Should this darken the room overmuch, we can use a candle or weak gaslight or lamp to work by. The same care should be employed when working wholly by artificial light. It is a small detail and generally overlooked. Attention to it will avoid waste of paper and give us greater satisfaction in our results. The ordinary room with semi-opaque Holland shades is perfectly safe. If the shades admit white light the volume of illumination can be easily reduced, or we can handle the paper in the shadow offered by placing ourselves between the window and the work-table, at some distance from the former. All we need is sufficient light to enable us to see what we are doing with comfort and without eye strain. This assured, the less superfluous light the better. For many reasons a good paraffin candle is almost ideal for the purpose.

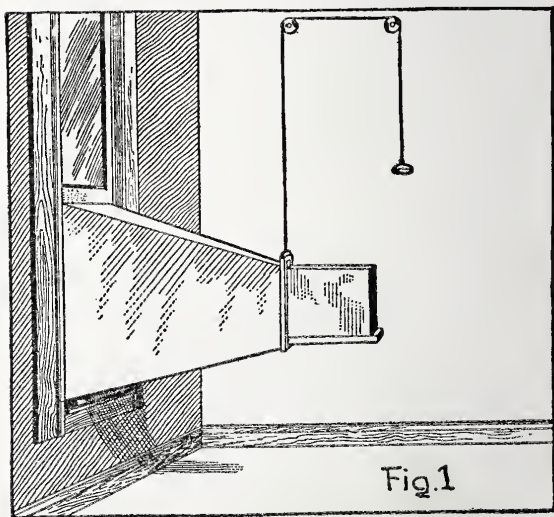
Exposing by Daylight The light for exposing the paper requires less thought. It should not vary in intensity, should be easily controlled, and we should thoroughly acquaint ourselves with its efficiency. Daylight is comparatively rarely used, because it is so variable and uncertain. Any artificial light, as gaslight, electric light, lamplight or magnesium light, is preferable simply because it is easily controllable and uniform in intensity. Thus, if a certain variety of paper, exposed for twenty seconds behind a given negative at twelve inches from a gas-jet, gives us a perfect print, we can duplicate this perfect print at any time by making subsequent exposures under precisely the same conditions throughout.

A practical method for exposing "gaslight" papers by daylight is to block the window of a room with opaque material, leaving a space ten or twelve inches square for the admission of light. Cover this square with one or two thicknesses of tissue, to soften the glare of the light, and fix a board to extend into the room from this space for about two feet. This board can be marked off in inches from the window, and the negative exposed at varying distances from the window

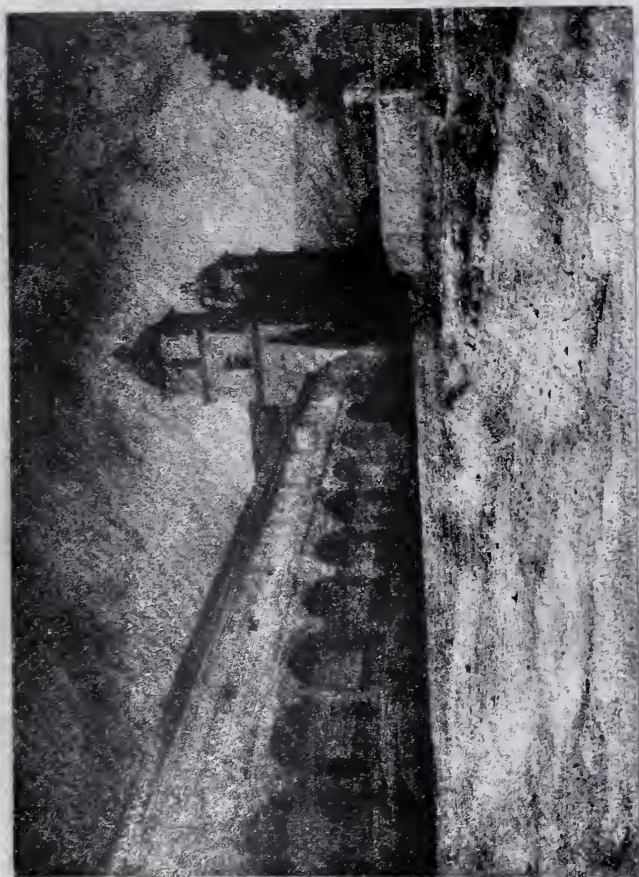
according to the density of the negative or the kind of paper used or other requirement.

A better plan, where daylight is to be employed steadily, is that given by Hoyt's Device Louis Hoyt in his "Photographic Printing Processess" (Photo Beacon Co., Chicago, 10 cents). I appropriate this method and its illustration with acknowledgment, presuming on Mr. Todd's good nature, for the benefit of the reader. Mr. Hoyt says:

"When working in the daytime all windows and openings should be covered with post-office paper, or



yellow curtain material. This may be obtained from all dealers in household goods. It is perfectly safe and is of a color that is easy on the eyes and allows one to see readily just what is going on. The printing light should be so arranged that there is an opening large enough to allow for the size of plate to be exposed. When printing by daylight, the simplest method



SANTA BARBARA MISSION, CALIFORNIA
Alvin Langdon Coburn
Fellow of the Photo Secession



THE RIVULET
Alvin Langdon Coburn
Fellow of the Photo Secession

is to make a four-sided pyramid out of some thin material, the larger end of which will cover the bottom sash of the window used. This box should project into the room, say from eighteen inches to two feet. The small end should be several inches larger than the largest negative to be printed from. A square box, the size of this small opening and (for an 8 x 10 negative) about a foot long, is fastened to the cone. Where the two join provision must be made to allow for placing a shutter which may be raised up and down. The front end of this box may be fitted with kits, to accommodate different sizes of negatives. To print, place the filled frame against the opening at the front, raise the shutter the required number of seconds and drop it. The sketch gives the construction of this printing light (Figure 1).

"Inside of the square box, just in front of the shutter, there should be strips arranged so that one or more pieces of ground-glass may be set to subdue the light as required. The printing window should be on the north side of the building, as the light there is more uniformly steady."

If we use gaslight as the illuminant, **Gaslight** either an ordinary gas-jet or an incandescent burner may be employed. The latter is, of course, the quicker illuminant of the two. It is impossible to give an accurate comparison of the relative efficiency, because burners, papers and negatives vary so much. Wenzel, using a seven-foot ordinary burner, exposes an average negative for from twenty-five to forty seconds, at a distance of three inches, but does not state the grade of Velox used. Abbott, with "Regular" Velox, working at the same distance from the light, gives an average negative one or two minutes, but does not state the size of the burner used. With Dekko, an exposure of two minutes, six inches from a six-foot gas-burner, is advised for an average negative. With a Welsbach burner Hickman gives from five seconds to three minutes for different negatives, at eight inches from the light. With a "normal" negative 4 x 5, at a distance of eight inches from a four-foot gas-burner, "Quick" Portrait Cyko requires fifteen sec-

onds; "Slow" Carbon Cyko needing sixty seconds. The light of a Welsbach burner decreases the exposure time one-third. With an average negative and "Special" Velox, at six or seven inches distant from the light of a four-foot burner, twenty seconds is approximately correct, or seventy seconds with "Regular" Velox. Pyro or yellow-stained negatives require longer exposures; thin gray negatives will not require so much time, being more transparent.

Mr. Hopkins prefers a Welsbach burner for exposure because it gives a white light and is steady. His method follows:

I print 5x7 and 4x5 negatives at twelve inches from a Welsbach light, using this as a distance basis. I can thus reduce the distance for denser negatives and increase it for thinner ones. Proportionate exposures at the varying distances will vary according to the annexed table—the factors for multiplying (while not absolutely exact in all cases) being sufficiently close for the purpose.

Distance from light to printing frame: in inches.	Proportionate exposure as compared with that at 12 inches	Printing time of a print when 20 seconds at 12 inches is correct.
6	$\frac{1}{4}$	5 sec.
9	$\frac{5}{8}$	12 "
12	1	20 "
15	$1\frac{1}{2}$	30 "
18	$2\frac{1}{4}$	45 "
21	3	1 min. 1 "
24	4	1 " 20 "
30	6	2 " 5 "
36	9	3 " "
42	12	4 " 5 "
48	16	5 " 20 "

Printing nearer the light *reduces* contrast and shortens the exposure.

Printing further from the light *increases* contrast and lengthens the exposure.

Many Velox workers prefer to hold the printing-frame in the hand during exposure—and, indeed, the Company's advertisements illustrate this method and

their demonstrators practice it. But probably that is to convince the public of the simplicity of Velox manipulation. If I have a print requiring much unequal exposure, I often try it; or to determine the best printing distance by test-slips, before setting it up in the other way. The hand method seems quicker, because the exposures are generally less; but for most prints the other method is really faster, because it permits four or five prints to be exposed at the same time. In setting them in position, the "slow-printers" should be first placed, and the "quickest printer" last of all. Then, by reversing the order, in terminating the exposure, one will have opportunity to get them all printed without overexposure. The frames should be placed bottom-side up in a pile as they are taken down, to keep from further light-action.

Another advantage of this several-at-a-time method is that the prints may be likewise developed in batches,—a quicker as well as more convenient way, and one which saves many steps.

Development of exposed Velox may be deferred from one evening to the next or even longer—just as sunlight papers are often carried over by the professional to be toned all together—but they should be placed where it is dry and absolutely dark. The envelopes in which Velox is sold are just the thing, and the prints should be wrapped inside the black-paper folder.

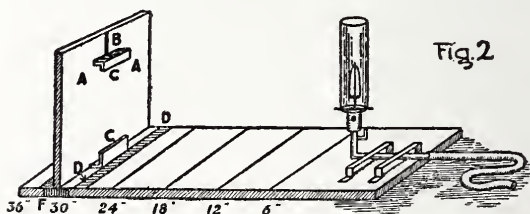
A very convenient method for exposing by gaslight, and a useful piece of apparatus, known as an exposure-board, is described by John A. Hodges in the *Amateur Photographer*. I borrow this, with the diagram, *pro bono publico*. Mr. Hodges says:

"In my own practice I employ an incandescent gas burner of the ordinary type, which takes a No. 3 mantle for exposing, and always fill the frames and develop by the light of a candle, using the white light unscreened, and working at a distance of about a couple of feet away.

"Now, if uniformity of results is desired, the ordinary practice of exposing by holding the frame up to the source of light must not be followed, for however

much care be taken to preserve the same distance between light and frame, the method will inevitably allow of a sufficient margin of error to account for quite a small crop of wasted prints by the time a packet of paper has been exposed.

"Any trouble in this direction may be obviated by using a simple piece of apparatus which is, or should be, familiar to every worker in bromide, and known as an exposure board. The diagram (Fig. 2) sufficiently



explains its construction. Mine is made of a piece of $\frac{3}{4}$ -inch deal board, 3 feet in length. At one end an ordinary incandescent gas-burner is fixed, and this should be provided with a bye-pass so as to enable the light to be turned up or down as required. If house-gas is not available an oil-lamp may be used; but in that case a fillet of wood should be screwed to the board, and care taken that the base of the lamp always touches it before commencing work. Parallel lines should be ruled across the bottom of the exposure board at intervals of 6 inches apart, and numbered 6", 12", 18", etc. The apparatus will stand upon a table, and if gas is used the connection is made with a piece of India-rubber tube to the nearest gas bracket.

"AA is a drawing-board about 11 inches by 14 inches, supported on a foot-piece, DD, 11 inches by 6 inches, at the edge of which, at FF, two brass plates are screwed to enable the whole to be shifted up and down the board to and from the source of light. CC are made of two fillets of wood nailed together at right angles, and are intended to clutch and hold the printing frame in position at right angles to the light. The

upper C is not screwed to the backboard, but slides stiffly in a vertical slot, so as to accommodate printing frames of various sizes."

It is obvious that an ordinary gas-jet, electric bulb, or kerosene lamp can be used with this exposure board with advantages over the ordinary method of exposing by holding the printing frame in the hand. Especially when we need to modify the exposure by vignetting or shading, the freedom of both hands is desirable.

Where it is available an incandescent

Electric Light electric bulb is sometimes preferable, and can be handled as described above.

It is a little slower than a Welsbach burner, and so permits of greater control during exposure.

A kerosene lamp is used for exposure

Kerosene by many, but it is yellow and works slowly, from four or five to twenty minutes. There is plenty of time here for any desired control, but it is apt to be tedious. Hines uses a lamp with a three-quarter-inch wick, keeping the flame at a uniform height. This lamp is set within a circle marked on a drawing-board, and printing frames are arranged at both sides of the flame at 6 inches distant. This is adapted for 4 x 5 and 5 x 7 prints only. No details of exposure time are given.

With all artificial illuminants the distance between the light and the negative varies according to the character of the negative and its size — for obvious reasons.

For commercial contact work or en-

The Bright
White Light larging on gaslight papers, where expense

need not be so closely considered and efficiency is chiefly desirable, no artificial light thus far mentioned can equal a hydro-carbon oil-light introduced by Williams, Brown & Earle, of Philadelphia, for optical projection and similar purposes. I simply mention this as the best bright white light at present available. A booklet fully describing its virtues can be had on application to the manufacturers.

It is possible to make development

Candlelight prints with candlelight as the illuminant, but a thin negative requires over an hour's exposure and the game is not worth the candle.

It is also possible to print - out the picture-image by exposing Velox behind a negative for some hours to strong sunlight. The image is weak and flat. I mention this because some people will expose Velox in daylight, as if it were a print-out paper, and complain because it prints so slowly.

An Alternate Method Sometimes it is not convenient to make use of either daylight, gaslight, electric light or kerosene lamp in the exposure of development papers. The man of the house is occupied with his business during the day, and daylight, even at its best, is an uncertain illuminant. The electric light and the kerosene lamp are alike unusual in many town houses or apartments. And gas fixtures are generally placed too high for comfortable working, whether we perch on a stool and hold the printing frame at arm's length, or attempt to rig up the exposure board mentioned on an earlier page. Those who have wrestled through an evening with Velox in the bath-room will appreciate the point. The difficulty can be completely overcome by the use of magnesium ribbon as the illuminant for exposure. So practical and convenient is this method that many workers have adopted it in preference to other methods. It offers a light for exposure at once uniform and easily variable at will ; it is simple and economical in manipulation ; and it effects a saving of time where dense or pyro-stained negatives are concerned. A word of caution should be given to those unfamiliar with the handling of magnesium ribbon during its combustion. Use a pair of pliers, or a hat-pin, to hold the ribbon to the flame by which it is ignited. It is apt to splutter and drop as it is consumed, and the burn resulting from magnesium is extremely painful and slow to heal. With reasonable care in practice, however, no trouble need be apprehended.

Magnesium Ribbon Magnesium ribbon, sometimes known as magnesium wire or tape, is well known to those who experimented in flashlight photography prior to 1870. Latterly, its use for this purpose in America has been displaced by the widespread popularity of compound flash-powders. In

England the ribbon is still extensively employed, and in the English market there are many devices providing for its combustion in measured lengths—a convenience for our purpose. The ribbon can be obtained from most dealers in photographic supplies, although not commonly listed in the catalogues of today. It is retailed in coils containing a few yards, at about 75 cents; or by weight at about 34 cents [1s. 3d.] per ounce. As the quantity of ribbon used for each exposure is very small, an ounce of ribbon will suffice for the exposure of many prints.

The chief feature in the use of magnesium ribbon for the exposing light depends on the fact that an equal length of ribbon at the same distance from the negative will always give the same result. Furthermore the time taken in exposing is so short that the total time required to produce a dozen or more prints is materially lessened, as compared with lamp- or gaslight. The requirements are very few. The long, narrow table which is usually found in the dark-room is best, on which are arranged, in the following order:—First, at one end a candle, in the flame of which the magnesium ribbon may be conveniently lit; then a space of, say, four feet marked off every six inches, so that the printing frame may be quickly set up any distance from the light. Next, the dish for the developer, then one for the hypo, and next to this a large washing tray; some sheets of lintless blotting paper and a roller squeegee will also be very useful.

The negatives to be printed from are now classified according to their density and also according to the particular variety of Velox on which we desire prints from them. The method of manipulation is as follows: A negative of ordinary density is placed in the frame with a piece of Carbon Velox. This is set up on end, exactly three feet from the light (note the appearance of the paper under the negative by reflected light, as this is one of the best guides to the density of the negative). All the magnesium ribbon likely to be needed is cut into lengths of exactly one inch. If pyro-stained negatives are used, the standard will have to be two or three

inches, according to color of negatives. One of these lengths of ribbon is taken in a pair of pliers, or on the end of a long hat-pin, and held in the flame of the candle; as soon as it has burned out the Velox is taken from the frame and placed in the developer without previous immersion into water, care being taken to flood the whole print and to avoid air-bubbles. Now watch carefully, and the moment the whole picture is faintly up it is withdrawn by one corner on to a clean sheet of glass, and held so that all the developer runs off at once. It can now be held quite close to the candlelight, and allowed to finish developing under careful examination. The moment it is sufficiently developed, plunge the print into the acid hypo, which stops all action. If preferred, it can be plunged into clean water instead, and then examined more carefully, when, if not quite enough developed, it can be returned to the developer; or a drop of the developer may be applied with the tip of the finger to any spot requiring it, the amount of water on the paper preventing the too rapid action of the developer.

The secret of success is to withdraw the print from the developer before it is quite finished and allow development to be completed on the glass; if it has been withdrawn from the developer too soon, it is easy to replace it; on the other hand, you can stop it at the moment you like if it is overexposed, and the chance of a spoilt print is very small after a little practice. As soon as a print is in the hypo the next can be exposed without risk of spoiling it, so that in a very short time a dozen or more will be in the hypo, from which they go to the washing water, where, if they are kept for ten minutes, and then squeegeed between sheets of white blotting paper, again placed in clean water, and once or twice again squeegeed, they will be quite free from hypo and dry in a very short time.

Variations in Color Modifications of color in different prints may be obtained by remembering the following: A short, full exposure and strong developer give normal black and white results; the weaker and more restrained the developer the longer the exposure must be, but the further over



YORK MINSTER
Alvin Langdon Coburn
Fellow of the Photo Secession



SAN JUAN CAPISTRANO MISSION, CALIFORNIA
Alvin Langdon Coburn
Fellow of the Photo Secession

to red tones the result will be. If, upon development, it is found that the exposure, i. e., the distance in inches of the negative from the burning wire, was exactly right, that distance is minutely marked in one corner of the negative—in this instance say thirty-six inches; and this number will in any future exposure of the same negative convey the fact that the normal exposure, i. e., to get black results with normal developer, will be one inch of magnesium ribbon at a distance of thirty-six inches on Carbon Velox, and on Special Velox will have to be one-half or once again as far, as it is about three or four times as rapid; and likewise, by exposing the same print at thirty-six inches to two, three or more inches of wire consecutively, and correspondingly restraining the developer, we can get any tone always repeated from that negative. If, on the other hand, the exposure had proved too much or too little on developing, we should alter the distance for the next print, and when the correct distance is once obtained it is scratched on the negative in the form of a single figure, which will at any future time give the correct distances in inches. Of course, the developer must be as known a quantity as your light, paper and distance, if the best results are to be obtained. This can readily be assured by the use of a standard ready-prepared developer, such as the Lotol tablets made for Velox papers, or, in Britain, the amidol tabloids of Burroughs, Wellcome & Co. To sum up: First, use plenty of light to work by; candles are best and safest. Second, remove the print from developer before quite finished, and allow it to finish on a glass plate. Third, alternate squeegeeing between blotting paper and placing in clean water gives the quickest way of removing hypo, and a final squeegeeing in blotting paper leaves a print which will be dry in a few minutes. Fourth, always use fresh developer.

This method, reprinted from the *British Journal of Photography* 1902, page 964, is, of course, applicable to any development paper, being modified according to the brand of paper used. As an example of its modification, I quote from an article in *Wilson's Magazine*, 1903,

p. 9, where Mr. F. E. Fairbanks relates his experience with Cyko. He says: Most of my negatives come within these limits, viz., one-half to three-quarters of an inch of magnesium tape burned at a distance of from twelve to eighteen inches from the printing frame, using Carbon Cyko. Exceptional cases, however, require special treatment, very thin negatives being exposed at a greater distance from the source of light, and very dense negatives much nearer—say six inches away—and perhaps a larger quantity of magnesium used.

The correct exposure may be determined by trial exposures on small scraps of paper, and when found noted on the negative envelope for future guidance. A convenient way of working is to have a board—with a lighted candle at one end—on which to ignite the magnesium, and spaces marked thereon—6, 12, 15, 18 and 24 inches from the candle. The printing frame being placed at the proper distance from the candle, the correct amount of magnesium tape held in a pair of pliers is ignited in the candle flame and allowed to burn, exposing the print, which is then developed as usual.

Personally, I expose the print in one room and develop in another; that, however, is a matter to be governed by personal convenience and conditions. One detail may be noted. There seems to be a difficulty in igniting a piece of the tape shorter than half an inch in length. Why it is so I do not pretend to explain, but simply note the fact. In cases where with thin negatives they would be overexposed, with this quantity of tape they can be controlled by exposure at a greater distance from the source of light.

For my own part I like a brilliant print, and it has seemed that the result was best attained by short exposure to intense light—i. e., as near the source of light as could be done without overexposure.

Variations in Exposure Having secured a general understanding of illuminants and exposure we can now talk intelligently about varying the exposure (or dodging) for different purposes. First, let us beware of very short exposures—placing the negative too near a bright light. This permits no latitude or control in printing and may result in uneven

illumination. Where the light is of such intensity that exposures of two or six seconds are correct, an error of half a second may ruin the print. By placing the negative normally, at such a distance from the light that our exposures will range from ten seconds to a minute, an error of a second or two in exposure will be less harmful. Moreover, at such a distance many methods of controlling or dodging the print are possible. In this, and in estimating the exposures, we should remember the old rule that the illumination varies inversely as the square of the distance from the source of light.

If we have a very thin negative we can apparently add to its printing density and get a more harmonious print by increasing the distance from the light. Contrariwise, if the negative is too dense and harsh in contrasts, we can move it nearer the light with advantage and the faults of the negative will not be obvious in the print. With very thin or uneven negatives the use of tissue paper or Newcomb's Retarding sheets is a big advantage.

Suppose we have a negative wherein one part is over-dense and another is over-thin. This often happens in getting a brookside landscape, or a view showing a river at one end of the print and a deeply foliated shore at the other; particularly with the newly popular panoramic cameras. Ordinarily, if we expose the print long enough to get detail in the water, we will find that it has been entirely "burnt out" of the foliage. What is to be done? Simply shade the foliage-end with a piece of cardboard during, say the first half of the exposure. Don't hold the cardboard still, but move it back and forth about half an inch; and when we develop the print, the junction between the portions receiving different exposures will not be apparent.

Cloud details may sometimes be coaxed out of a very dense sky without overprinting the foreground, if the frame instead of being held upright is inclined backward at an angle, so that the sky portion is nearer the light. Detail at one side of a portrait and similar backward portions of negatives may be brought out by this modification in exposure. If this means is not sufficient, local development of the portions so helped in exposure

may further aid in attaining the end in view. A finger tip dipped in developer and very gently rubbed over the backward portion of the print will effect this. Rubber tips should be used on fingers so employed, to protect sensitive skins from the action of developer or alkalies. A small tuft of cotton on the end of a match or in a fountain pen filler will accomplish the end quite as well if skilfully handled.

It has been suggested that vignetting can be done in the development of gas-light prints, and it is possible by following the suggestion given on another page. But the work can be more advantageously done during exposure. One way is to cut a hole of suitable size in a piece of cardboard and quietly move this to and fro in front of the negative during exposure, at a distance of from three or six inches. Another way is to cut a proper vignetting card, or employ a regular vignetter, which can be had for a trifling sum. This should be fixed to the front of the printing frame so that an inch of space is left between the vignette opening and the negative. The frame is, of course, kept moving during the exposure, if this is made near a bright light. At a distance of eighteen inches and with a slow printing light the movement is not essential.

In the same way, by the use of pieces of cardboard or opaque or semi-opaque shields of different sizes and shape any desired part of a negative can be held back during exposure. Thus heavy foregrounds can be helped or dark corners done away with; in fact, this paragraph and the one on variations during exposure should be read together.

Though less easy with development papers than with the printing-out papers, in that the progress of the printing cannot be judged, double-printing is entirely practicable. Much depends upon the accurate registering of the sheet in the printing frame for the second printing. By the following method this can be assured :

Find the position of the negative in the frame, *as you wish it to be*, and secure it in this position by narrow bits of wood between the negative edge and the inside

of the printing-frame. Strips of passe-partout binding may be used to fasten a small negative or film negative to a piece of glass which fits the frame; this, of course, being larger than the negative being printed from.

Now prepare another frame for the second negative and fix the latter in the same way with wood or binding, so that when you place a piece of paper (not Velox, but a piece of common writing paper cut to the size required) on first one negative and then another, it will register exactly as to distance from the frame. A print from the principal negative may be used to get exact results, if preferred. At any rate, be sure that when the sheet of Velox is finally placed in the frames, one corner of it will *fit squarely into a corner of the printing-frame*—I usually make it the lower left corner. When the sheet is removed and placed in the other frame for the second printing, it will fit squarely into the corner of that frame, too. In this way you will be just as certain to hit the right spot as though you saw the image. The two-frame method is infinitely better (to my mind) than the need for removing one negative and inserting another; as it permits repeated exposures from one negative before printing the second one at all. To prevent the prints becoming reversed, mark a small cross on the back of the corner which is to fit snugly.

In preparing a mask to cover the portions of the negative one wishes to omit from the print, I employ a simple method, free from guess-work. It is to take a print of the whole negative, and paste it down on a sheet of black paper—the kind such as Velox comes wrapped in from the manufacturer. When dry, cut along the horizon line, or wherever you are going to join the two printings. Be sure and don't cut across trees and buildings and tall chimneys, but around them. Save carefully both pieces of the print. Probably no other use has been discovered for a very dull pair of scissors, but for this use they give a somewhat torn effect, which is desirable.

Fasten these pieces to the negatives, the foreground-mask on the cloud-negative, and the sky-mask on the foreground-negative. Fasten them on the glass side, of course, and take care to adjust the masks before tack-

ing, with a drop of paste or glue. Then put the sheet of Velox into the frame so that the part covered by the mask is at the bottom. When exposed, according to the time required for a print from the unimproved negative, change the sheet into the frame carrying the cloud-negative, and stand the frame at exactly the point where the first frame stood—mark it when you take the first frame down!

If you need a light of different intensity from that of the first printing, alter it *by turning the light itself up or down*, but do not alter the distance between light and printing-frame. In case of an incandescent electric bulb, put a sheet or so of tissue between the light and the frame, close to the former. Set the second frame with the mask-covered portion at the top: and the result should be a print in which the joining line is almost unfindable.

To tack the masks on the glass direct is the easiest way; but the better way is first to paste a strip of paste-board along the straight edge of the mask—(some bit of a plate-box is good enough)—and then set this paste-board on the glass with a drop of glue at each end. In this way we secure a greater distance between the paper and the mask and better diffused effect. If we do not want absolutely opaque paper for the masks, use post-office paper, or even brown wrapping paper that is free from specks, or a wove bond-paper. In a too "contrasty" negative, such a mask will sometimes soften the gradations of the print.

Here is another method which means more work, but is useful when there is a lot of "tinkering" to be done to get the proper amount of diffusion. Set up two printing frames of the same size, face to face, holding them together by means of two rubber bands near the ends. Previously make, with a brad-awl, a small hole in the center of each side of the printing frame—or each end, as you prefer. Into each of these holes a brad is inserted to hold the negative from falling out when the frame is standing on edge. Put the brads in loosely with the fingers, so that they may be readily withdrawn. In the first frame put the principal negative, and in the

An
Alternative

second put a paper mask against a piece of plain or ground glass, held in by brads, also. Stand the pair of frames before the light and move about until the right position is attained. When found, tack the mask in place with a dab of paste or glue.

If this does not give sufficient diffusion, slip a couple of matches between the frames (the rubber bands will hold them) or slide in two pieces of thicker wood until the diffusion appears to be satisfactory. Now move the whole affair from and toward the light, till we get the proper distance for printing density, and then we are ready to print.

If our two negatives are of different sizes, get two frames the size of the larger negative, and we can use an inside kit to hold the smaller one; just as when we use a small plate in a large holder. The brads will have to be removed from the frame which carries the paper before exposure. The brads in the other frame may be short ones, or the hole into which they fit may be deeper, so that they will go well in and not obstruct the printing. In the second printing, two other frames should be used, and the manipulation is the same. When once the frames and masks are fitted in position, the printing process is rapid—and the whole preparation takes less time than to describe it.

All such double-printings are best developed by immersion until one or two of the deepest shadows appear—then pour the developer back into the bottle and finish with a brush. If, when the print is developed there is any junction-line visible in the print, the fault is ours and should not be imputed to the method, which is well proven.

It makes very little difference whether
Dodging one calls the process "dodging" or "improving the negative," so long as the desired result is a better print than would otherwise be obtainable. Whatever we may call it, gaslight papers are readily adaptable to such manipulation, particularly if we use the two-frame, face-to-face method suggested on another page.

Let us suppose that we have a view showing figures in a rather shady foreground against a brightly-lighted

background, full of detail. If we print sufficiently to get the latter detail, we shall over-print the foreground figures; and if we expose our print for the figures, the background will be most uninteresting. But we can whip both foreground and distance into proper form, by setting up the two frames as suggested, with a piece of ground-glass in the second frame, with its roughened side next the light so that we can work on it.

If daytime leisure is available, it is convenient to stand the two bound-together frames on the dividing sash of a window, and get the light that way; but if the surrounding light is too trying on the eyes, one can use an eyeshade, or cover the space around the printing frame with a piece of cloth to keep off all the light except what comes through the frame. We can now proceed leisurely to examine the negative and determine where the image appears too dull and where too bright—for the ground-glass will diffuse the light and make it look different from what it did before.

Wherever we wish to bring out all the detail the negative affords, touch the ground-glass over such points with the tip of a small brush dipped in warm vaseline, dabbing it on sparingly in a series of small dots, like the spotting of a print. The vaseline will spread and make the dots into a thin, all-over coat on the glass. An excess would tend to make it run where it was not wanted. The vaseline acts much as though over those portions of the negative there was no ground-glass at all. When printing in a warm room lay the frame face up to prevent the vaseline from spreading.

The quick-printing parts of the negative which it is desired to restrain may now be taken in hand, and rough, "sketchy" marks made with a lead-pencil on the ground-glass. They should be made like the close-together uprights of a picket fence, and one need know nothing about drawing to do the work. The effect is to obstruct part of the light which otherwise would go through the glass to the negative, making the printing slower.

If it is found that the effect produced by the black pencil is too strong, try putting the lines further apart,

or using a blue wax-crayon—blue being a less obstructive color than black. Those who incline to making experiments can try yellow and red crayons also. Indeed, to get detail in an underexposed foliage negative the use of several colors will give a mottled effect like that produced by the light coming between the leaves, giving a varying diffusion and definition. It is usually best to put the marks of the different colors in different directions—upright, horizontal and oblique. This seems to fill up spaces more evenly.

Three very apparent advantages result from this method. It is easy to alter at will, even by the inexperienced tyro; it may be carried to any desired point and watched all the time; and it does not in any way affect the negative for subsequent use without the ground-glass. When the printing is completed, the ground-glass should be washed clean, and it is then ready for another negative. Thus we can produce a special effect for a few prints, and yet have the negative as it was for further regular-effect printing. Or, if permanent effect is desired, the ground-glass and negative can be put away in the same envelope. Not alone with gaslight papers is this a useful dodging scheme, but with gum, carbon and printing-out papers as well.

In enlarging from a negative so improved, the resulting prints are notably satisfactory, and save considerable work in controlling the printing of the different densities.

The two-frame idea is suggested because less careful pencil work may be indulged in; but if the diffusion is not satisfactory the ground-glass may be placed face out in the frame and the negative in the same frame, face in (next the paper to be printed). Then the same sort of shading may be done. While making the shading, the positions of the ground-glass and negative may be reversed, if desired, so as to work inside the frame on the ground-glass; but when replaced for printing the negative and shading will be so close together that the pencil work must have been done with considerably more care than in the other methods. In working with the ground-glass and negative at some distance apart, a firm even-textured white paper might be used for these

variations if stretched tight ; save in experienced hands, however, the result is apt to prove unsatisfactory.

Almost any of the modern developers, **Developers** and especially those advised for bromide printing, can be used for the development of gaslight prints. Nine-tenths of the manufacturers, however, advise a combination of metol and hydroquinone. The most famous of these combinations is the M Q developer, ready prepared by the manufacturers of Velox. As the beginner will seek the easiest methods at first, we will take the M Q tubes, obtainable from any supply dealer, and give a method of quickly preparing them for practical use in development. Take a single tube of M Q.

Provide a four-ounce bottle with a **M Q Tubes** new cork, and fill it two-thirds full of water ; either distilled, or boiled and filtered. Take the cork out of the end of the M Q tube with a penknife and, placing the open end of the tube in the mouth of the bottle, tap the white powder from the tube down into the water, shaking the bottle meanwhile. When done, cork the bottle and shake vigorously until entirely dissolved. Then with a knife-blade pick out the second cork from the tube which separates the two parts of the developer. The first division contains the alkali ; the second contains the metol and hydroquinone and the sodium sulphite. Now tap the rest of the tube's contents into the bottle, keeping out the air as much as possible, and when emptied, cork the bottle again and shake the powder into solution until no deposit appears at the bottom. Now add five drops of a 10 per cent solution of potassium bromide and fill the bottle to the cork with water.

By this method the developer is prepared for use without exposing the chemicals to the air, consequently it will keep indefinitely and not darken in a day or two and lose its developing power.

If we prefer to prepare our own developer, we can easily follow out the same general idea of keeping the ingredients and the solution away from the air, and only a word of caution is essential. The sodium sulphite used must be pure and kept air-tight if we want to get

prints free from yellowish whites. The unused sulphite cannot be too carefully kept. Use either a ground-glass stopper or a cork coated with paraffin and then tin-foil wrapped around the bottle-neck. *Impure sulphite will not give clear white prints.* Notice the care with which the sulphite is protected in the M Q tubes: In glass, under two corks and a layer of alkali, and the outer cork paraffined. Seed's Chemical Pure Sulphite is advised for this purpose.

M Q is a good developer, but the principal reason why better results are not obtained by self-compounded developers is simply from lack of care in obtaining the pure sulphite, and lack of proper precautions to keep it in good condition.

If the four ounces of developer are likely to be kept more than a week, it is a good idea to store in one-ounce bottles, tightly corked and entirely filled, and laid to one side. So kept, one does not expose the whole batch when developing, and this method will keep the solution unimpaired for a year or more.

To prepare our own M Q developer from the raw materials we need first the well-known formula: Water, 10 ounces; metol, 7 grains; sodium sulphite (desiccated) 4 drams; hydroquinone, 30 grains; sodium carbonate (desiccated), 200 grains (or crystals 400 grains); 10 per cent bromide potassium, 10 drops. The quantity of bromide is suggestive—not always exact. The proportions above are correct for use on "Regular" Velox; for the "Special" Velox an equal bulk of water should be added. With brush development no such distinction seems necessary.

The latest formula for Velox, intended for advanced workers and commercial use is a stock solution developer, as follows: Luke-warm water, 200 ounces; metol, 7 drams; hydroquinone, $3\frac{3}{4}$ ounces; sodium sulphite (desiccated), 15 ounces, or 30 ounces sodium sulphite crystals; sodium carbonate (desiccated), 25 ounces, or 50 ounces sodium carbonate crystals; potassium bromide, $\frac{1}{2}$ -ounce, crystals. This is a concentrated developer which will keep for several weeks in

a demijohn, or indefinitely in filled bottles, well stoppered (tight corks covered with layer of wax dropped from a burning candle). The formula is used diluted with twice its bulk of water for "Regular" Velox, and with four times its bulk of water for "Special" Velox; thus making 600 ounces of the former strength and 1,200 of the "Special" developer.

Two parts water and one of stock solution *can* be used for both Regular and Special papers, by adding enough 10 per cent bromide potassium to get clear whites on the Special paper and not enough to give greenish blacks on the Regular.

The developer should be used at from 65° to 75° Fahrenheit.

In using this developer, place the prints directly in the developer without previously rinsing them in water. If friction marks appear when developing the Glossy paper, two drops 10 per cent cyanide potassium to each ounce of developer will be a sure prevention [Cyanide potassium is too deadly a poison to use carelessly, and personally, its use is *not* recommended]. The cyanide, when used, will "work out" of the bath after a time, and more must occasionally be added.

After a few days, the stock solution may throw down a slight precipitate, which, however, does no harm, as perfect prints can be made while it is present.

Dilution of the stock solution is advisable in most instances, and when the amount of water is added the precipitated chemicals will redissolve and disappear. The solution should be shaken before being poured off to be diluted for use, so that its strength may continue unchanged until the last.

Development in the (one part developer two parts water) bath is completed on the "Regular" papers in about fifteen seconds, and on "Special" papers in the same strength bath in about twenty seconds. If used in the half-strength bath, the time should not exceed thirty seconds. Immediately after removing prints from the developing solution, they should be rinsed by dipping in water for a second, before placing them in the fixing bath.

For use with *Cyko* the formula is somewhat modified,

less carbonate of soda being used. Here is the official formula: Water, soft or distilled, 32 ounces; metol, 15 grains; hydroquinone, 60 grains; sulphite sodium (dried powdered), 1 ounce; carbonate sodium, $\frac{3}{4}$ ounce; potassium bromide, 4 grains. Dissolve in the order named, and remember that while the above amount of bromide is usually sufficient, it may at times be found that more of the bromide solution must be added in order to produce clear whites, owing to the chemical composition of the water used.

This formula is intended for use with "Slow" *Cyko*; for "Quick" *Cyko* use double the quantity of water in the developer.

These chemicals will dissolve in cold water, but much more readily in warm water; if warm water be used, the solution should be allowed to cool before using, about 70° Fahrenheit being the proper temperature.

For *Vinco* further modification is needed, the formula being: Water, 20 ounces; metol, 30 grains; hydroquinone, 10 grains; sodium sulphite (granular), 110 grains; sodium carbonate (granular), 110 grains; potassium bromide, 2 grains.

With soft, detailful negatives, shorten the exposure and use the developer at full strength; for vigorous negatives, dilute one-half with water.

For *Rotox* (and *Rotokon*) the developer advised is: Water, 32 ounces; metol, 1 dram; sodium sulphite, 6 ounces; hydroquinone, 2 drams; sodium carbonate (granular), 3 ounces.

This forms a stock solution. For use, take one part stock solution to six parts water. For soft effects give long exposure and add more water; for "contrasty" effects use less water and give a shorter exposure. Five drops of a 10 per cent solution of bromide of potassium should be added to each 6 ounces of developer. This developer will yield rich black tones with clear high lights, and by varying and using more or less water and bromide, will give equally good results from thin or strong negatives.

For black tones on *Gravura* (Paget) the formula reads as follows: Hydroquinone, 55 grains; metol,

14 grains; sodium sulphite (recrystallized), 1 ounce; sodium carbonate (crystals), $1\frac{1}{4}$ ounces; potassium bromide, 2 grains; water to make 20 ounces in all.

For *Dekko*, the use of amidol is advised, a stock solution being first prepared. *Stock solution*: Amidol, 80 grains; sodium sulphite (crystals), 1 ounce; water, 10 ounces. For use, take of stock solution, 1 ounce; water, 3 ounces, and add 5 drops of a 10 per cent solution of potassium bromide. This is a simple and economical developer, giving blue-black tones.

An Amidol formula recommended for Velox is as follows: Water, 8 ounces; sulphite of soda (crystals), 100 grains; amidol, 20 grains. Add potassium bromide in drops as required to keep the whites pure.

This is rarely advised for development papers, but I have found it advantageous. In preparing it I use the ordinary M Q formula, omitting the metol and substituting an equal quantity of rodinal.

Leaving metol-hydroquinone out of the discussion, the following formulæ have all been advised at various times by good men and true. Mr. Hopkins, for Velox papers, thus gives his favorite Tolidol formula. When only a few prints are made per week, prepare the developer in half the following quantities. Prepare four solutions: *A*. Water, 8 ounces; Tolidol-Pfabe, 2 drams; sodium sulphite (C. P. anhydrous), 2 drams. *B*. Water, 8 ounces; sodium sulphite (C. P. anhydrous), 4 drams, (or by hydrometer test 40 degrees). *C*. Water, 8 ounces; sodium carbonate (C. P. anhydr.), 1 ounce. *Restrainer*. Bromide potassium, 4 drams; water, 5 ounces.

For Velox and other developing papers use about as follows: Solution *A* 2 parts, *B* $1\frac{1}{2}$ parts, *C* 2 parts; and add water $6\frac{1}{2}$ parts; restrainer, 2 drops. Try an unexposed piece of the paper in the developer and see if it remains undarkened for forty-five or fifty seconds. If not, add a couple drops more restrainer and try another scrap of paper—a piece one inch square is big enough. When you get enough bromide you will have

made it easy to get clear whites. But do not dose it in too liberally, or the results will be unpleasant greenish olive-brown shades to the blacks. The developer as given is neither unduly fast nor slow.

A second Tolidol formula for Velox, which has often proved useful, contains potash instead of soda and is credited to F. J. Monsen. It follows: Tolidol, 20 grains; sodium sulphite, 90 grains; potassium carbonate, 90 grains; water, 4 ounces. For bath use, dilute with equal bulk of water just before use. For brush work, leave full strength and add a little bromide. As with the Tolidol formula at first given, brush development is well done when the water is reduced from 6½ parts to, say, 4. In such case it not only acts more quickly, but seems to give more brilliant prints.

This new developing agent is well spoken of for gaslight printing and is especially favored by those to whom the use of other developers proves injurious. It does not stain the finger-nails and is not poisonous to the skin.

The following is the regular formula and may be used on both developing papers and plates, made up in either one or two solutions: *A.* Water, 3½ ounces; sodium sulphite, (anhydrous), 155 grains; Edinol, 31 grains. *B.* Water, 3½ ounces; sodium carbonate (anhydrous), 155 grains. The sodium carbonate may be replaced with 90 grains of Acetonesulphite-Bayer. For Velox development, take of *A.* 1 ounce; *B.* 2 ounces; water, 3 ounces. Add enough bromide potassium to keep the whites clear, about one drop to each ounce of developing solution.

Two special formulæ for Velox, which the makers of Edinol recommend, are as follows:

1. Edinol, 15 grains; sodium sulphite (anhydrous), 60 grains; acetonesulphite, 15 grains; acetone,* 6 drams; water, 5 ounces.

2. Edinol, 15 grains; acetonesulphite, 75 grains; sodium carbonate (anhydrous), 113 grains; water, 5 ounces.

* Bear in mind that acetone and acetonesulphite are two entirely different chemical compounds. Acetone is obtainable of any good supply dealer, at about the price of good carbonate of soda. It gradually evaporates from the solution, and, as this occurs, more acetone must be added to take its place.

Either formula should be diluted with an equal bulk of water, and bromide added if necessary to keep the whites clear. Both formulæ are recommended as exceedingly stable solutions. The same formulæ may be used for plates and films, without dilution with water or addition of bromide. It will be noted in this respect Edinol differs from M Q, in that the quantity of M Q, which makes only four-ounce solution for regular Velox, will make eight to ten ounces for plates and films.

If one likes the M Q formula in general, Edinol may be substituted in place of the metol and hydroquinone (reference being had to the first M Q formula already given), in four variations, as follows:

A. Substitute 37 grains of Edinol for the metol and hydroquinone, leaving remainder unchanged; *B.* Substitute 37 grains Edinol, as in *A.*, and substitute 40 grains acetonesulphite for the sodium sulphite in the M Q formula; *C.* Instead of 37 grains Edinol, use $18\frac{1}{2}$ grains and an equal weight of hydroquinone; *D.* Take 15 grains Edinol, 45 grains acetonesulphite, and 113 grains anhydrous sodium carbonate.

The quantity of bromide added varies the character of the prints materially, and some few experiments will demonstrate just what proportion produces prints most to the individual liking.

Another Edinol formula, from Mr. A. H. Bailey, reads like this: Distilled water, 32 ounces; Edinol, 4 drams; acetonesulphite, 1 dram; sodium sulphite (anhydrous), 4 ounces; potassium carbonate, $2\frac{1}{2}$ ounces. This might be objected to by those on whose skins the potash acts unpleasantly, otherwise it has all the ear-marks of a good developer. Equal parts of the above and water are to be used. The Edinol and acetonesulphite should be put into half the water and then shaken up together, afterward adding the sodium sulphite and letting it dissolve. The potash should be dissolved separately in the other pint of water and the two solutions then mixed.

Gaslight prints are developed in three ways, according to the preference of the worker: First, by simply immersing the print in the developer; second, by floating the print,

Development
Methods

face down, upon the developing solution and completing development by laying the partially developed print face up on a sheet of glass ; and third, by means of a brush or mop. The second and third methods admit of various dodges and so are most generally used by more expert printers.

The immersion method needs little description. Taking the exposed print from the printing-frame, place it in a porcelain tray half filled with clean water. Here it will become limp while the required quantity of developer is poured into a graduate. Now pour off the water and make sure that the print is face uppermost in the tray. Pour the developing solution over the print quickly so as to cover the whole surface of the print evenly without air-bubbles. The image will appear in a few seconds, more or less, according to the variety of paper used and the correctness of the exposure. As soon as the print reaches the desired depth, quickly transfer it to another tray containing clean water, to remove the superfluous developer, and finally transfer it to the fixing bath, where it should remain ten or fifteen minutes, being kept moving for the first few minutes.

The method of development by flotation ing prints on the surface of the developer is thus described by Mr. John A. Hodges in the *Amateur Photographer* :

Pour sufficient developer into a clean porcelain dish to completely cover the bottom to a depth of about one-third of an inch, and, by the way, the dish used for development should be reserved for this special purpose, and kept quite clean by rubbing with dilute hydrochloric acid. Cleanliness is absolutely essential to successful working ; chemical contamination, or the use of a dirty developing dish, will inevitably produce markings on the prints.

By the side of the developing-dish have another large porcelain dish full of clean water, and in a third dish the fixing bath. The exposure having been made, and the light turned down, the paper is removed from the frame and plunged, face downward, in the dish of clean water below the surface, so that both sides of

the paper are thoroughly wetted. Immersion for about one minute will be sufficient for the thin papers; the thick ones will require longer. Look carefully at the coated side of the paper before developing, to see that no air bells, sometimes very minute, have formed upon its surface, as these would cause white spots on the print; they can be removed by dragging the paper smartly along the surface of the water, or by passing a clean mop of wet cotton-wool over the surface. It is essential that the hands be kept free from traces of hypo or other chemical contamination, otherwise stains and markings will assuredly appear upon the prints.

Take the wetted and exposed paper gently by one end—not corner—and place it, coated side downward, on the developer—the knack of doing this properly will soon be acquired. The object is to wet the entire surface of the paper quickly and uniformly with the developing solution. The paper should not be put down flat, or dropped, on to the surface of the developer, but slidden, as it were, on to its surface, just in the same way as one would develop an ordinary platinum print. As soon as the paper has been in this way brought into contact with the developer, it should be turned over, face upwards, and pushed below the surface. We find that this method avoids stains and any chance of uneven development; and we strongly recommend its adoption, in detail, in lieu of the mop or brush system sometimes advocated.

It may happen that the high lights will show a slight fogging or degradation; the remedy for this is "bro-mide," but the additions must be made very cautiously, for a single drop of a 10 per cent solution added to four ounces of mixed developer may be sufficient to cure the defect. If more than is necessary be added, the prints instead of being as they should be when the developer is working properly, a pure engraving black color, rivaling even carbon or platinotype in this respect, will tend to a greenish or brownish black.

The actual development of a print on a gaslight paper is a very fascinating sight, closely resembling the development of a platinum print. If the exposure has been correctly timed, and the developer be of proper

strength, the picture will begin to appear in about 10 seconds, and development should be complete in from 20 to 30 seconds.

With normal development, that is to say, when the image is allowed to develop right out, it is desirable to rinse each print in clean water, in order to remove the developer before the print comes in contact with the fixing bath.

Mr. Hopkins is an enthusiastic believer in the development of gaslight papers with a brush—one brush or more as needed. He describes his method as follows:

We will need a flat camel's-hair brush for the work—one which is bound in rubber is best. Some people prefer a tuft of absorbent cotton instead of a brush, but I have not found this desirable, because I cannot regulate the lightness or heaviness of touch so accurately. Emulsions on the coarser-grained papers must not be rubbed too hard, and besides, the cotton becomes saturated with the developer,—and metol injures my skin. If one is inclined toward economy in first outlay, an imitation camel's-hair brush will do. The so-called letter-press brush about two or three inches wide can be bought of any stationer, but, being tin-bound, it will be likely to shed hairs on the prints sooner or later.

If neither the brush nor the cotton tuft appears just what you want, try a long-nose medicine-dropper, to the end of which has been fastened a tuft of absorbent cotton held in place by a small rubber band wound around the "nose." The advantage of this is that it will fit in the developer bottle and sufficient liquid will be sucked up into the dropper to last some time, and still be kept away from the outer air till needed. Pressure on the rubber bulb will, of course, increase the flow when a part of the print is reached which needs vigorous development.

A second and smaller brush (while in no way essential to the process) is often of much use in working up small spots in a negative; and it, too, should be rubber-set. It may be from half an inch to an inch in width, as one prefers, and should "point" moderately well.

You may use an ordinary water-color brush with a wood handle and tin-bound, or a quill-handle brush. The metal on the former can be made impervious to the developer by giving it several coats of *heavy* rubber solution (used to mend punctures in rubber tires), first cleaning the metal with a tuft of gasoline-moistened cotton, and letting each coat thoroughly dry before applying the next. The quill-handle brush is simpler, and can be made less fragile if a piece of wood is fitted into it all the way down to the point of binding. Instead of this small brush, one might use a second dropper with a smaller tuft, but I prefer the brush.

Unless you are looking for warm-toned prints, rinse your developing-tool—whether brush or cotton-tuft—after every four or five prints; in case of the cotton, better throw it away and substitute a new piece, as it mats down after a while.

A tray, one size larger than the largest print to be developed, will be needed, and also a piece of glass (a scrap of plate-glass is best) of the width of the tray and say two inches longer, to gain a slight incline when set in the tray. After the developer is prepared, the brush or brushes are dipped in clear, cool water and then shaken out semi-dry. If you work with your face toward the light, hang a piece of cardboard near the light to intercept its direct rays from the developing tray, or turn your back to the light and work in the shadow of your own body.

And now to work. The largest Manipulation prints I make by contact are 5 x 7.

For them I use an 8 x 10 tray and a sheet of glass in proportion. The next smaller size tray would suffice, but I like plenty of room and the tray is useful for developing enlargements. I open my first printing-frame and take out the sheet of Velox and after pouring about half a spoonful of developer from the bottle directly on the brush—the later prints will require only a few drops—I lay the print, face up, upon the glass, usually without previous rinsing (though it somewhat retards development and does no harm), and go quickly over the entire surface with the brush, with light but vigorous strokes.

I keep this up until the print does not become darker by repeated brushing.

To keep the print from slipping on the glass, one may either hold down a corner with the thumb or finger—in which case the rubber finger-cot is decidedly useful—or else (if not previously moistened) snap a thin elastic band around the glass and slip the end of the print under it. Not having been soaked in water, the tendency of the sheet to curl will tend to keep it in position under the elastic.

Owing to the small quantity of developer on the brush, there will be little or none to trickle down into the tray. At the end of an evening's developing, you will be surprised to see how little residue is left.

The advantage of this development method is obvious—the developer bottle, being kept corked tightly between prints, is therefore unoxidized either by the air or by the return to the bottle of used developer.

If you use two brushes, exchange the large for the narrower one as soon as the image is fairly distinct, and paint lightly away on the print at the points you wish to appear most prominent, leaving the portions you wish to restrain with less attention from the brush.

Now, when you have brought up the particular parts of the print you wish darkest, take the large brush again and go over the entire print a few times lightly, to blend together the portions variously acted upon by the solution, and prevent any apparent lack of uniformity.

Then take the print (still attached to the sheet of glass) out of the developing tray and slide it endwise into a dish of clear water (to rinse the developer off the paper instead of having it clog up the fixing-bath) for a few seconds' immersion—say long enough to get the next print out of the printing-frame, after which it is ready for fixing.

**Combining
Bath and
Brush** Another method, which combines the advantage of the bath and brush method, is as follows: After a number of exposures are made, I open the first frame and give the print a quick rinse in clean, clear water (to prevent curling) before I slide it into the developing tray and pour the developer over it, patting out any

air-bubbles with a bit of absorbent cotton fastened to the end of a match. Just as soon as the deep shadows commence to appear, I whisk the paper out of the developer and into clean water for a second or two while I pour the developer back into a bottle and cork it. This keeps the solution from oxidizing in the air before the next print goes in. Next, out comes the print from the tray, with a shake to rid it of some superfluous water, and down it goes on a sheet of glass resting across the developer tray. Development is completed with the brush. Such a method both saves time and renders better prints. Three trays are needed, —one for developer, one for rinsing-water and the third for fixing-bath. The water in the second should be renewed for every ten or a dozen prints.

In connection with this outfit, it is well to have a small bottle, through whose cork has been thrust the quill-handle of a small camel's-hair water-color brush—so the brush is kept out of the dust and air when not in use. Use the cork as a handle. I fill the bottle about one-fifth full of regular 10 per cent bromide potassium solution (it is not necessary to be exact) and fill it up with water. This makes about a 1-50 solution and you can dab it on rather recklessly, without absolutely stopping development where it touches. Do not try to cut a hole through the brush-handle: burn it through with a hot wire. A dab of this solution will restrain any parts of the image which appear to be developing too rapidly; and yet it will not "paralyze" the print as the 1-10 solution will.

A very useful convenience in developing prints with the brush is the S. & F. Dry-plate Handle, obtainable from most dealers. If the sheet of Velox is held on a piece of glass by two very narrow rubber bands at the ends, attaching one of the handles makes it possible to manipulate the print in and out of water-baths and developers without touching the paper at all—an advantage always, and with very rough papers often a necessity.

The danger of separation between paper and sensitive coating is thus avoided. The handles are made

of some non-corrosive metal and are not expensive (fifty cents a dozen); and they are just as useful for plates as for papers. By the way, you can use old spoiled plates to rest the paper on in development without even troubling to clean off the film.

Saving of time and paper is not the only recommendation of this method. It permits one to work with metal without wetting the fingers.

The Use of Bromide

All developers require the addition of a certain amount of bromide of potassium to keep the whites of the print pure and clean; and it is most conveniently used in a 10 per cent solution, which is made by dissolving one ounce of bromide in nine ounces of water, making the solution up to 10 ounces in all. As the amount of bromide necessary varies with the age and condition of dryness of the paper and the purity of the water and chemicals used, it can only be given approximately. It is easily determined, however, by first adding the amount given in the maker's formula to the solution and then making a trial test by laying a half-inch strip of paper over an important portion of the negative and printing and developing it in the regular way. If the whites appear fogged, add a few more drops of the bromide solution. If, on the contrary, the whites are clear and the blacks have a greenish tinge, there is too much bromide in the developer and it will then be necessary to add a little of a stock solution of developer that contains no bromide. To avoid this latter necessity, in adding to the amount of bromide, do so very slowly and drop by drop, making tests as directed.

Note that when just enough bromide has been added to keep the whites clear, the blacks may have a bluish tinge. If, then, more bromide is added, little by little, and a test print made after each addition, the tone of the blacks will be seen to change gradually from bluish black to pure black, and if still more bromide is added, to greenish or brownish blacks.

Sugar as a Retarder

As the addition of bromide in quantities tends to change the tone of the print, the use of sugar as a retarder of development was suggested by Dr. Baekeland to aid in controlling

the speed of development. For this purpose, one or more teaspoonfuls of granulated sugar are added to each four ounces of developer, and with this syrupy solution development proceeds so slowly that any amount of control is provided for. With the addition of sugar the brush development on glass is obviously the method to pursue. In this way, also, local development or vignetting during development is rendered comparatively easy with perfect control.

The treatment of the print when development is completed, by whatever method is employed, varies according to the instructions issued with the paper. With *Velox* and most other papers, the print is simply rinsed in clear water for a moment and transferred to an acid-hypo bath. With other papers this rinsing in water is not advised, and the paper is transferred direct from the developer to the fixing bath. With other papers, such as *Vinco*, a "short stop" bath is advised to arrest development, after which the print is transferred direct to the fixing solution.

First, let us prepare the fixing bath. For *Velox* the formula reads: Prepare two solutions. 1. Hyposulphite of soda, 16 ounces; water, 64 ounces. 2. Sodium sulphite, $\frac{1}{2}$ ounce; commercial acetic acid (ordinary variety), 3 ounces (or glacial 50 degrees, $1\frac{1}{2}$ ounces); powdered alum, $\frac{1}{2}$ ounce; water, 5 ounces. When the salts are completely dissolved the two solutions are mixed and well shaken, the bath is then ready for use. The *Nepera* Acid Fixing Powder is, however, a much more desirable convenience and will save all this compounding.

A plain hypo solution, which is strongly recommended by *Hodges*, is as follows: Hyposulphite of soda, 4 ounces; water, 16 ounces. This should be tested with blue litmus paper, and the acid reaction, if any, neutralized by adding liquid ammonia drop by drop until the reddened paper regains its original blue hue.

The acid fixing bath for *Cyko*, also obtainable ready prepared, is identical with that given above for *Velox*, except that 12 ounces of hypo are advised instead of

10 ounces in No. 1, and $\frac{1}{4}$ ounce of powdered sodium sulphite instead of $\frac{1}{2}$ ounce in No. 2.

For *Dekko* a simpler bath is recommended, as follows: Hypo-soda, 1 ounce; acetic acid, 4 drops (or alum, $\frac{1}{4}$ ounce); water, 5 ounces. Prints on *Dekko* are placed in this direct from the developing solution without rinsing.

Vinco prints, after development, are transferred to a "short stop" and hardening solution prepared as follows: Water, 32 ounces; powdered alum, 1 ounce; table salt, 1 ounce. This arrests development. After 10 to 20 seconds' immersion the prints are transferred to the following fixing bath: Hypo-soda, 4 ounces; water, 16 ounces; sodium sulphite (granular), 1 ounce; water, 5 ounces. Dissolve these separately, adding to the sulphite solution 1 dram of sulphuric acid or 2 drams of acetic acid, after which the two solutions are mixed.

As soon as the print is ready for fixing it is immersed in the hypo bath either by sliding it in edgewise or tapping it down under the surface at all points to be rid of air-bubbles. Keep it moving for a few seconds so that the bath may act on all parts equally. It is unnecessary to put your fingers in it, if you provide a wood or quill toothpick with a tuft of cotton fastened to the end by an elastic band. But if you do get hypo on your fingers you need seldom stop to wash them. All that is necessary is to dry them on a towel pretty thoroughly. Then you can go ahead with the development of another print without fear of spotting it with hypo stains. This is a point none too widely known. Dry hypo does not seem to hurt gaslight prints.

Now a word about fixing. The mistake is often made that to leave the prints in the fixing bath for longer than fifteen minutes is to injure them. Not only is this not the case, but the fixing is sometimes incomplete in that time. In order to save time, I have come to this method. After I have rinsed the developer off each print and placed it in the fixing bath, I stir it about for a moment to get it thoroughly covered, and there I leave it—face down. Then I do the same with another print, and then another, leaving all the prints in the fixing bath

until the evening's printing is finished. Then when the last print is developed, I turn my attention to the fixing, and I handle over the prints one by one for *at least fifteen minutes*. Then I know they are fixed!

It is well worth while to use a large tray for this purpose. I use an 8x10 tray, which, besides being larger, is somewhat deeper. This enables me to use plenty of fixing bath, which is an economy instead of an extravagance, as the prints fix quicker and the bath may be used repeatedly. It is foolish to use less than a pint of the bath even for a half-dozen prints. The use of my 8x10 tray permits me to make two piles of my prints; and changing them from one pile to the other enables me to know that one print is not handled ten times and another but twice. This ensures uniform fixation. After a couple of evenings' use, it is well to add to the fixing bath a few drops of acetic acid to replace that which has been lost in prior use.

If you have a dozen prints or less, **Washing** they may be washed in an ordinary round or oval toilet bowl, the water running gently and the bowl being emptied at intervals of five minutes; handling the prints meanwhile, as in the fixing bath. A half hour's washing of this sort ought to be ample. Care must be used in handling over prints on rough-surface papers not to let the emulsion become separated from the paper. It is easy to distinguish rough papers while washing, because they will float while the others will be inclined to sink. Such a washing as this will do more good and wash the prints more thoroughly than several hours' aimless floating about in a tank in batches of half-a-dozen which cling to one another and therefore do not get washed. If more than a dozen or fifteen prints are made in an evening, it is best to make two or more separate washings—each of about that number.

Drying Prints In drying gaslight prints, one may follow either of several methods: lay them on blotters or newspapers to dry spontaneously; blot off the superfluous moisture with hard blotters. Be sure to get the fluffless (Royal or Robosal) kind, which will not stick to the prints; or

(and this is the best way) they may be placed in pairs back to back, with a string between them, the string being suspended over a piece of newspaper. Then, while drying, each keeps the other from curling. Should they curl from any cause, however, a scraping action of a bone or celluloid "folder" along the back, cross-wise and lengthwise, will straighten them.

The prints may be mounted wet or dry. If the former, they should be soaked a minute in clear water and then the excess of it blotted off from the back, the print meantime remaining face down upon a perfectly clean piece of glass. The paste commonly sold in tubes is rather too moist for this use, but that bought in jars can be left uncovered a few hours and the extra moisture evaporated. Then applied with a moderately stiff brush and well worked into the paper, the print will be well mounted. If dry mounting is preferred—and on flexible album-leaves it is the best way, the moist tube-paste is just the thing. A squeegee roller is very convenient in mounting, and should be of the two-roller variety, to prevent moving the print on the mount while rolling down.

We have now completed our survey of development papers and their manipulation, as far as black and white prints are concerned. It was my intention to extend the survey and include such modifications as enlarging, warm-toned prints, prints in colors and so on. But already we have exceeded reasonable space limits and must end the excursion as briefly as possible. In a second monograph, perhaps, we will take up the story where it is here left off. This is, in fact, the only way to do justice to the interesting modifications possible.

It may be that the reader will miss any mention of "failures and remedies." Perhaps they should have been discussed. But the list is too lengthy and would make a book in itself. I must refer the reader, therefore, to the makers of the different papers when they encounter difficulties "beyond finding out." Most of the common sources of failure will be evident to those who know the principles underlying intelligent manipulation, and I have tried to make these plain.

After-
Thoughts

Notes

We keenly regret the fact that several errors and omissions in our last number, *THE PHOTO-MINIATURE* for December, marred the pleasure of some readers in that interesting number. The redoubtable author of the monograph, Mr. R. James Wallace, has written in hot wrath about it, and we, ourselves, have not "felt happy." However, here is a remedy in a concise list of corrections and additions. The reader can pencil these at the points marked in the original monograph. *Plate 1.* "Spectrum print, No. 5," should read "Cramer slow iso." *Fig. 11.* Seed 26x, exposure one minute. *Fig. 12.* Seed 26x, exposure sixty minutes. *Fig. 13.* A. Seed Portrait ortho; B. Seed L. ortho; C. Cramer-med. iso; D. Cramer-inst. iso. *Fig. 14.* A. Carbutt ortho; B. Carbutt polychromatic; C. Standard Portrait ortho.; D. Orthonon. *Fig. 15.* A. Forbes ortho; B. Cadett spectrum; C. Hammer ortho; D. Lovell C. D. *Fig. 21.* Seed 26x, exposure twenty minutes.



There are signs of deep unrest in the teacup world of photographic journalism and, in western phrase, "things are billed to happen." Mr. Stieglitz has published the first number of his quarterly, *Camera Work*, and there are rumors of trouble between those who got copies and those who did not. It is even said that there is trouble and heartburning among those who did obtain copies, some agreeing and others disagreeing concerning points, divers and sundry. All agree, however, in the opinion that it is the most wonderful photographic magazine ever published. We hope to give it extended notice in a later issue.

Mr. R. Child Bayley, of *Photography*, has returned to

the humdrum of life in London after his brief American tour. *Photography* is now put forth on the American plan, wherein coated paper and half-tone illustrations are combined with lavish prodigality on an ample page. The price of the paper has been advanced from one penny to threepence per week, but it is mailed flat, with cardboard backing; for which last grace we are devoutly thankful. To ease the awkwardness of the price Mr. Bayley is regaling his readers with a series of papers entitled "Little Journeys Among Men and Things Photographic in America." The editor of *Photo Era*, of Boston, inclines to sarcasm concerning Mr. Bayley's estimate of men and things American, because the American journeys did not reach as far as Boston. But that is a small matter. The beloved Thomas Harrison Cummings, by the way, after a week in Rochester and Lockport, N. Y., devoted to "scooping" all the advertising in sight, has returned to Boston and forthwith sends out a rival to *Camera Work*, in the shape of a new *Photo Era*, enlarged to 9 x 12 inches. We have never seen the *Photo Era* within so beautiful a cover as that in which it now appears, and congratulate Mr. Cummings on his trip to Lockport. As for the rest of the paper, it is quite as good as the *Photo Era* of earlier days, to say which is no slight praise. No further additions have been made to the staff of associate editors, as far as the new number indicates, so that Mr. Cummings has evidently wrested the new endowment fund from another source. To be serious, we wish our contemporary every success in its new form.

That canny Scot, F. Dundas Todd, of Chicago, has dressed his *Photo Beacon* for 1903 in sober brown paper, a welcome change from the canary-yellow sporting colors of 1902. The January *Beacon* is, in our opinion, one of the best numbers Mr. Todd has yet given us, full of varied interest and helpful information. To vary the monotony of the *Beacon's* success, Mr. Todd has just brought forth (the hackneyed phrase is peculiarly appropriate to adventures of the sort here related) a new monthly magazine entitled the *Home Bazaar*. This is intended as a medium of exchange for

those unrestful people who want to trade kodaks, vintage 'oo, and the like, for telephone systems in Texas, terriers, foreign stamps and parrots. We know of few investments offered which promise so much fun, as well as food for thought, as the *Home Bazaar* at fifty cents per year. The subscription price includes a 25-word advertisement free to subscribers, which "may be used all at one time or at convenience," and may also be repeated (free) until the article is sold or worn out.

There are other signs of unrest in other photographic journals, but enough is as good as a feast, and we desist.

By the death of Mr. Jex Bardwell, at Detroit, December 14 last, American photography lost a stanch friend, proved in many a fight against threatened monopoly in bygone years, and one whose personal knowledge of the evolution of photography was probably unsurpassed in this country. Mr. Bardwell was instructed in Daguerreotypy and the Talbotype process by Egerton, who had a studio in the Fleet, London, and by Professor Pepper, at the Royal Polytechnic in Regent street. This was in 1844, when these processes were in their infancy. A few years later he took up the practice of photography as a profession in Detroit, and there spent the greater portion of his life. Apart from the daily routine of professional work, Mr. Bardwell was indefatigable in experiment and deeply read in photographic literature. He was also an enthusiast in stereoscopic photography and the use of the optical lantern as a means of public instruction and entertainment. A kindly, generous-hearted old man, full of years and knowledge, he will be missed most by those who knew him best. May the earth rest lightly upon him.

The Photo-Secession! What is it? and what are its objects? Since its exhibition at the National Arts Club, last March, we have seen it written about in the *Century*; we have heard all kinds of rumors concerning it, but no one, until quite recently, seemed to have any

definite conception of just what it was and of whom it consisted.

We at last learn that it is a national organization without constitution and by-laws, created expressly for the purpose of uniting all those interested in the advancement of American pictorial photography, as that term is understood by those who have made it the talk of the photographic world.

We understand that all those interested in this cause, whether photographers or not, are eligible to be enrolled. The management is in the hands of a council, with Mr. Alfred Stieglitz as director. Among its members are some of the most active and prominent of the pictorial photographers of the country, such as Käsebier, Steichen, Eugene Keiley, Devens, White, Dyer, Watson, Schutze, Stirling, Bullock, Redfield, etc. The photographers constituting the organization are designated as fellows or associates. Judging by what we hear, a fellowship will indeed be a distinction coveted by all serious pictorial workers. It is intended to hold larger and smaller exhibitions as the occasion may warrant, and above all it is proposed that the Photo-Secession will exhibit as a body whenever its Council deems it in the interests of the "cause" to concentrate its efforts.

Further particulars about this curious organization can be gleaned from the organ of the Photo-Secession, *Camera Work*, No. 1, Vol. I.



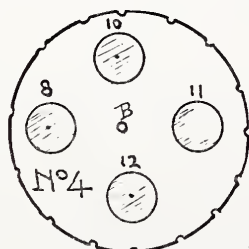
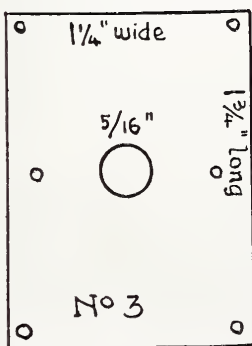
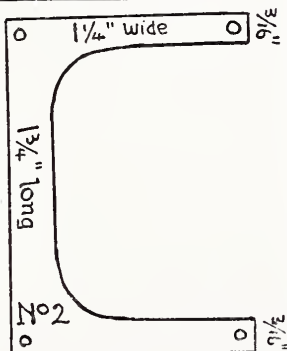
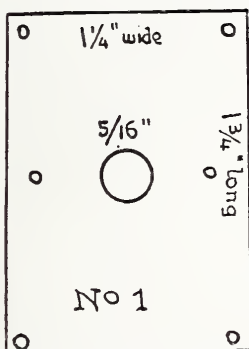
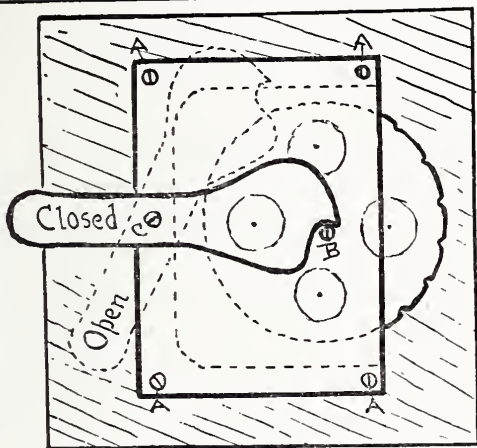
McCorkle's Needle-hole Apparatus. The publication of THE PHOTO-MINIATURE No. 27: *Pinhole Photography* (June, 1901) awakened, among American amateurs at least, a very keen interest in the possibilities of photography with simply a needle-hole in place of the lens generally used. The results obtained by different experimenters, together with accounts of their experiences with the needle-hole, have appeared in many photographic journals, so that we now have a generous amount of information on this interesting subject.

Among those who have experimented few have

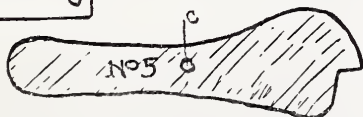
worked so enthusiastically, or with such variously interesting results as Mr. James H. McCorkle, of Canaseraga, N. Y. We have received from this gentleman needle-hole photographs of shipping and river scenes, landscapes, interiors, street views, New York skyscrapers and portraits. In these prints, the usefulness and advantages of the needle-hole, covering a wide range of subjects and conditions, have been demonstrated in a very practical way.

One of the first things Mr. McCorkle did was to simplify the production of satisfactory needle-hole apertures, and to devise an apparatus adapting the needle-hole for use with the ordinary camera, such as all amateurs possess. In this he has produced what, in our opinion, is the simplest and best needle-hole apparatus at present available. Mr. McCorkle generously permits us to publish details of his apparatus and sends the diagrams here reproduced for the benefit of our readers. The right to republish the device and description is reserved by Mr. McCorkle, but readers of **THE PHOTO-MINIATURE** are free to use the design in making apparatus for their own use. We understand, however, that the Century Camera Company, of Rochester, will place the apparatus on the market at an early date.

The construction of the apparatus is extremely simple, and calls only for a few pieces of black celluloid or fiberloid $\frac{1}{8}$ -inch gauge (obtainable from dealers in electrical supplies), six $\frac{1}{4}$ -inch round-headed brass screws, a knife and a few needles. The diagrams are drawn to actual size. No. 1 is a sheet of black matt celluloid $1\frac{1}{4}$ inches wide by $1\frac{3}{4}$ inches long, with four screw-holes at the corners, and a circular aperture $\frac{5}{8}$ of an inch in diameter at the center of the board. This piece is fixed on to the ordinary lens board of the camera. No. 2 is a double armed piece of celluloid, shaped as shown, pierced for screws at the four corners. When placed on top (or in front) of No. 1 the long, straight edge of No. 2 is placed flush with the left-hand edge of No. 1. No. 4 is a celluloid disk $1\frac{1}{4}$ inches in diameter, with the edge notched or milled as shown. The four circles are so marked on this disk



McCorkle
Needle-hole
Shutter
1902



that their centers are all at the same radius from the center of the disk. Each smaller circle is scraped, on one side of the disk, until the celluloid is extremely thin at the center of the smaller circular space, and the needle-hole is pierced at the true center of the circle. As shown in the diagram, one circle is pierced with a hole $\frac{3}{32}$ -inch for use as a finder or to compose the view on the ground-glass, another with No. 10 needle, the third with No. 11 needle, and the fourth with No. 12 needle. Additional apertures can be provided for on the circular disc by the user at will. This gives four apertures of different sizes in the apparatus. The disc (No. 4) being prepared in this way is placed in front of No. 1 within the arms of No. 2, so that the pinholes will swing round and center over the large circular opening at the center of No. 1. Piece No. 3 is now placed over pieces Nos. 1, 2 and 4, and the four pieces firmly fixed together by the screws at the four corners, AAAA, the circular disc being fixed by a similar screw inserted at B (shown in the general view). The shutter-piece, No. 5, is now fixed in front of piece No. 3 by a screw inserted at C (general view), and the apparatus is ready for use.

In the general view the apparatus is shown complete, as fixed on the camera front board. The solid black lines exhibit the appearance of the apparatus, the dotted lines indicating the positions of pieces 2 and 4; piece No. 1 being completely covered by the front piece, No. 3. The shutter is shown in position closing the pinhole (these being faintly indicated) and also open, swinging over and off the pinhole on the central screw C. With the materials mentioned and a very little skill, an hour's work will provide the reader with a needle-hole apparatus capable of doing a great deal of photographic work in an entirely satisfactory way.



Few photographic firms in America can show such a rapid growth in prosperity as the Folmer & Schwing Manufacturing Company. Within the last few years this enterprising house has more than doubled its facilities, but the continued growth of the business demands still

further enlargement. To provide for this we learn that the company will from February 1 be located at 407 Broome street, corner of Elm street, New York. The new location will concentrate the offices, show-rooms and factory of the firm in one building, thus again doubling the facilities and enabling them to fill their orders more promptly and give their customers better attention. The products of the Folmer & Schwing Company are justly regarded as being second to none in the world's market, and we congratulate them upon their success.



The Bausch & Lomb Optical Company, Rochester, N. Y., advise us that their action in advancing the date of closing their Quarter-Century Photographic Competition to October 3, 1903, has met with very general approval among photographers, who realize the importance of this competition, and are anxious to submit as perfect work as possible. A number of the foremost photographers of the country have signified their intention of entering the competition, and the whole spirit of the competitors indicates quite as much interest in making the exhibits the best that have ever been gotten together in a competition in this country as in winning the pecuniary awards,—which, however, amount to \$3,000 in the aggregate. The special award of \$300 as a grand prize for the photograph showing the best lens work of any submitted in the competition is attracting a good deal of attention among photographers who seek to know the lens and its possibilities.



The simplest and most satisfactory explanation of "The Principles of a Lens' Action" within our knowledge is that given in a booklet bearing this title, issued by Taylor, Taylor & Hobson Ltd., St. James Building, New York. A copy of this booklet can be had for the asking, and every reader of this note should see to it that he obtains a copy before the edition is exhausted. The booklet is the work of Mr. William Taylor, one of the principal authorities on lenses, and is well illustrated.

—Apropos of the reorganization of the Cramer Dry Plate Company, of St. Louis, we are asked to state that the impression that this company has been sold to a syndicate is untrue. All that has been done is this: At the request of a committee of representative photographers, an option was given them for the purchase of 4,500 shares in the new company to be reorganized at a capitalization of \$1,000,000.

A portion of these shares is now offered for sale to photographers of this country. The option is granted for a short time only, and if shares are not subscribed for speedily by photographers, on the terms named, then the option will be withdrawn and the G. Cramer Dry Plate Company will continue as heretofore.

Of the \$1,000,000 capital of the company the present stockholders retain \$550,000. Subscriptions by individual photographers already made reduce the amount of shares now offered for sale to a little over \$300,000. The capital of the proposed new company will be divided into shares of \$100 each. These shares when issued will be full paid and non-assessable. There will be no preferred stock; hence, all shareholders will share alike in the profits of the new company in proportion to the amount of their stock.

The Cramer Dry Plate Company has been, is now and will continue to be an independent corporation. This new plan would make it, through coöperation, a business enterprise of photographers by photographers for photographers and should appeal to every camera worker.

A circular giving information in detail can be had from the office of the G. Cramer Dry Plate Company, St. Louis.



A cleverly written brochure on the advantages and uses of the telephoto lens has been issued for free distribution by the Bausch & Lomb Optical Company, of Rochester, N. Y. It gives many points of value to those who desire to combine a telephoto attachment with the hand camera, and should be seen by all interested. Copies can be had from most dealers in photographic supplies or from the home office at Rochester.

Tennant and Ward's List OF NEW BOOKS AND PUBLICATIONS

PHOTOGRAMS OF THE YEAR 1902. A Pictorial and Literary Record of the Artistic Photographic Work of the Year. Compiled by the Editors of *The Photogram*. (8th volume of the series.) The only annual record of its kind. 200 pp.; 200 illustrations. Paper, \$1. Library edition, \$1.25, postfree. Send for detailed prospectus.

AMERICAN PICTORIAL PHOTOGRAPHY. Representative examples of the work of the American School of Pictorial Photography. Selected by and reproduced in photogravure under the personal supervision of ALFRED STIEGLITZ, and formerly published by "Camera Notes." Series I, *net*, \$15. Series II, *net*, \$8. The edition was limited to 150 copies of each series, and only a few sets are obtainable. Descriptive circular on request.

THE "CAMERA NOTES" IMPROVED GLYCE-RINE PROCESS for the development of platinum prints, including the experiments of ALFRED STIEGLITZ and JOSEPH T. KEILEY. Illustrated with facsimile reproductions in color, by the experimenters. Reprinted from "Camera Notes." Only a few copies obtainable. Paper covers, *net*, \$1.

AN INDEX OF STANDARD PHOTOGRAMS. Being a guide for Authors, Editors and Publishers of Illustrated Books and Periodicals, Collectors of Pictures, etc., listing photographs available for publication purposes. Sold by subscription only. Particulars on request.

PHOTOGRAPHY FOR NATURALISTS. By DOUGLAS ENGLISH. A book for those interested in photographing animals, etc. 132 pp., fully illustrated. \$2.50.

PRACTICAL NOTES ON TELEPHOTOGRAPHY. By BECK LTD. A pocket-book of practical information. Cloth, 25 cents.

THE A B C OF PHOTO-MICROGRAPHY. A practical handbook for beginners, by W. H. WALMSEY. With plain instructions and many engravings. 155 pp.; 28 illustrations. Cloth, *net*, \$1.25.

PHOTOGRAPHIC APPARATUS, its making and repairing, by various English writers. 128 pp.; many diagrams. Cloth, *net*, \$1.

FINISHING THE NEGATIVE. An encyclopedic treatise on all the processes between development and printing. Edited by GEORGE E. BROWN. 160 pp.; profusely illustrated. Cloth, *net*, \$1.25.

THE LENS. A practical guide to the choice, use and testing of photographic objectives. By GEORGE E. BROWN and THOMAS BOLAS. Profusely illustrated. 176 pp. Cloth, *net*, \$1.25.

Descriptive Circulars and Book-List on Request

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Eagle Gallery,
Tripods, all grades.

LENSES:

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Eagle Wide-angle, 2 grades.

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And all regular Magazines.

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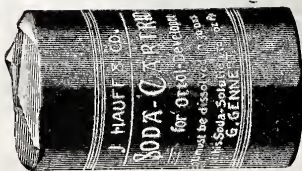


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Eastman Kodak Company

ROCHESTER, N. Y.

THE EVIDENCE

REPEATED DEMONSTRATIONS PROVE THE KODAK DEVELOPING MACHINE A SUCCESS

What we have been taught from our earliest recollection; what we have believed all our lives; what is accepted by everybody as a fact that needs no further verification becomes so a part of ourselves as to require rather more than ordinary evidence before it can be "unbelieved." Not one photographer in ten thousand, amateur or professional, believed, before the introduction of the Kodak Developing Machine, that negatives could be properly developed by the watch; the idea of using the same receptacle for developing, and then for fixing, and then for developing again, was to them preposterous. You might just as well try to persuade them that the sun rises in the west and sets in the east, that fire is cold and ice is warm. Certain beliefs—or rather a blind belief in certain methods—have become part of the photographer's nature. We do not claim that we were any less strong in our belief in these methods than other people. Our conversion to the Kodak Developing Machine was not easy. We tried it, and tried it, and tried it before we were willing to take hold of it commercially. "This," we said, "will be the greatest thing for photography since the invention of the Kodak Cartridge—if it works." That little "if" stood for a long time in our way. But the evidence was too strong for us. It worked. The "if" was abolished so far as we were concerned. Then we set about abolishing it for other people. They were slow to believe, but the evidence is now bringing them rapidly to our viewpoint. The demonstrations and the testimonials are telling.

Prejudice and skepticism are being overthrown every day. More and more people are recognizing that the Kodak Developing Machine will do all that we claim for it. The evidence is overwhelming.

BEAT THE DARK-ROOM ON QUALITY

I had a skeptical customer yesterday who did not believe the machine would develop all kinds of exposures on one film correctly. He offered a test, which I accepted. He went out and exposed two twelve-exposure rolls of No. 4 film; some in the street, some interior and some on the river in each film. He came in with them today, one for me to develop in the machine, he to develop the other in the dark-room. I got everything ready, with him watching, and in exactly 15 minutes after he came in, showed him the developed film from the machine. He admitted it was excellent, exceeding his

Kindly mention THE PHOTO-MINIATURE

Eastman Kodak Company

ROCHESTER, N. Y.

expectations, then retired to my dark-room to develop his roll. In about one-half hour he came out, saying: "Well, you beat me. I guess I will have to buy a machine." He had developed only six exposures and became disgusted with his results as compared with mine.

There is no question that the advent of the Developing Machine will give a great impetus to the sale of Kodaks and film, that great bug-a-boo, the dark-room, being done away with and the consequent muss, fuss and time usually expended in developing, abolished.

Yours truly,
I. LEESER COHEN, Blumauer-Frank Drug Co.

IT DOES THE REST

West Point, Ga., Oct. 10, 1902.

* * * The Developing Machine is a wonder in its simplicity and results. Anyone that can push a button, turn a crank and tell time by a clock ought to be able to make a picture. You can certainly do the rest with the Kodak Developing Machine.

Yours truly,
J. P. MILLER.

CONVINCED ANOTHER SKEPTIC

New York, Nov. 8, 1902.

At a demonstration of the Developing Machine, very ably given by your representative this afternoon, we had quite a crowd, sold several machines and without a doubt made many converts to the daylight film system of photography.

The machine is certainly a wonder. A skeptical customer of ours brought one of his own films to be developed, as he did not believe the machine would do all that was claimed for it; but after showing him the film developed and fixed without the use of the dark-room, and without handling, he was convinced and bought a machine.

Thanking you for giving us the demonstration, and predicting a large sale for the machines, we remain,

Per I. Forshay, Mgr.

Yours truly,
R. H. INGERSOLL & BRO.

PHOTOGRAPHIC COMPETITIONS

For the benefit of those interested, we will give here, each month, a bulletin of the important photographic contests in progress throughout the United States.

BAUSCH AND LOMB OPTICAL COMPANY, Rochester, N. Y. International competition. \$3,000 in prizes. Closes October, 1903.

C. P. GOERZ OPTICAL WORKS, 52 Union Square, E., New York. Cup competition for professionals. Closes August 1, 1903.

LESLIE'S WEEKLY, 110 Fifth Avenue, New York. Weekly competitions open to amateurs. Prizes, \$10, \$5, \$1.

BUFFALO EXPRESS, Buffalo, N. Y. Continuous contest. Prizes, \$5 to \$25 weekly.

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There are few amateur photographers who cannot be benefited by the Kodak Correspondence School of Photography. Whether they use the Kodak Developing Machine or whether they stick to the dark-room methods, it will help them over the hard spots. It treats both the technical and artistic sides of photography in a simple manner that appeals to the novitiate and immediately widens his photographic horizon. The text-books are clear, concise and free from bewildering technicalities. Honest, individual criticism is given to each pupil's work. Photography, especially film photography, can be readily taught by mail because of the facility with which the actual results of the amateur's work may be passed back and forth between teacher and pupil. This school is open, upon payment of one dollar, to all owners of Kodak and Brownie Cameras. Read what some of our pupils have said:

GREATLY BENEFITED

I joined your Kodak Correspondence School of Photography early last August, and am very much pleased with the booklets, and particularly the one on "Picture-Taking and Picture-Making."

I have studied these books carefully and submitted many pictures to the K. C. S. P. Department, and can readily say I have been greatly benefited in every way by the criticism I received. I sincerely recommend the Kodak Correspondence School of Photography and advise all who are interested in this fascinating work to join at their earliest opportunity.

Cordially yours,

JEAN S. TAYLOR, No. 106 Wilson St., Brooklyn, N. Y.

JUST THE THING FOR THE AMATEUR

Fort Wayne, Ind., Nov. 13, 1902.

I have not lost my interest in your Correspondence School. I think it's just the thing for the amateur in photography. We do not beg for information now; we ask for it and get it in a way that we know it's straight goods, just right. I lose no opportunity to explain it to my friends and will do all I can to keep it going. Believe me, I am,

Yours truly,

GEO. KENSILL, No. 132 E. Suttentfield St.

SAVES ITS COST

N. Grosvernordale, Conn., Nov. 11, 1902.

I have derived a great deal of benefit from the School of Photography, and think it is a dollar well spent, as it will save one many times that amount in material that anyone would spoil in experimenting by themselves.

Truly yours,

HELEN F. BENSON.

CRITICISM VALUABLE

Pasadena, Cal., Nov. 5, 1902.

I wish to tell you what a fine thing your Kodak Correspondence School has been for me. The text-books have made the work easy to understand, but the privilege of sending work to you for criticism has been worth more than the cost of the text-books. I have advised several of my friends who have Kodaks to join your school.

Yours truly,

LAWRENCE MACOMBER.

Kindly mention THE PHOTO-MINIATURE

Eastman Kodak Company

ROCHESTER, N. Y.

HAPPILY DISAPPOINTED

Washington, D. C., Oct. 25, 1902.

Eastman Kodak Company, Correspondence School Dept., Rochester, N. Y.

Gentlemen:— * * * I am frank to say that I had not expected such attention as shown by your letter of the 21st inst.: and, as before said, am encouraged to pursue the course. I had looked for a stereotyped reply, probably on a printed form arranged for various kinds of defects, etc., to be checked off, and I hadn't much faith in the value of the course to me if carried out on such a line. I am delighted to find myself mistaken; and with such criticism as I now hope to get, I hope to progress to the point of making much more than "fair" negatives, and do not expect to rest content with anything less than the best. Shall certainly work to that end. Yours very truly,

WM. M. NETHERLAND, 1643 Thirteenth St., N. W.

FOUND CRITICISMS CORRECT

Conesus, N. Y., Nov. 6, 1902.

Allow me to congratulate you upon the success which is bound to follow the institution of the Kodak Correspondence School of Photography.

For a number of years I have been an enthusiastic amateur, and in that time have studied everything photographic which has chanced my way. When informed of its institution, I subscribed for a course in the school more out of curiosity than for any benefit I expected to receive. I have sent numerous negatives and prints for criticism, including many in which I had purposely misapplied my knowledge of exposing, developing, printing, etc., and, knowing the cause of the failure, have found the criticism correct in every case and the remedies so clearly stated that the novice could not fail to understand them.

The text-books are alone worth double the price of tuition, and I believe every amateur would be repaid two-fold by entering the Kodak Correspondence School of Photography.

Yours truly,

GEO. C. WEBSTER.

CLEAR AND EXPLICIT

Marengo, Ill., Nov. 6, 1902.

* * * I desire to express to you my hearty appreciation of the advantages gained through your establishment of the Kodak Correspondence School of Photography. The clear and explicit instructions of the booklets make them alone worth all of the small cost of enrolment: but it would be hard for me to express the great gain it has been to me to have the advantage of individual instruction through correspondence. It has been given so fully, and in such a cordially pleasant manner, that instead of the feeling that it is a matter of business I have the feeling that I am corresponding with a warm personal friend, competent to advise and deeply interested in every detail of my work. Volumes of reading would not so well help to overcome some fault as to have my good teacher (and I am glad it's always the same one) point his finger right at the spot, and say, "There, that's the trouble." How you can afford it all is a mystery to me; a mystery that perhaps I should not be too curious to solve, so long as I may have benefit. Gratefully yours,

C. C. MILLER.



Discharge of an Eastman Flash Cartridge with pistol. Note the spread of light

Eastman's Spreader Flash Cartridges

A new flashlight of great actinic power, which, by reason of the spread of light, gives a softness in the shadows not obtainable with other flash cartridges. ALL DEALERS.

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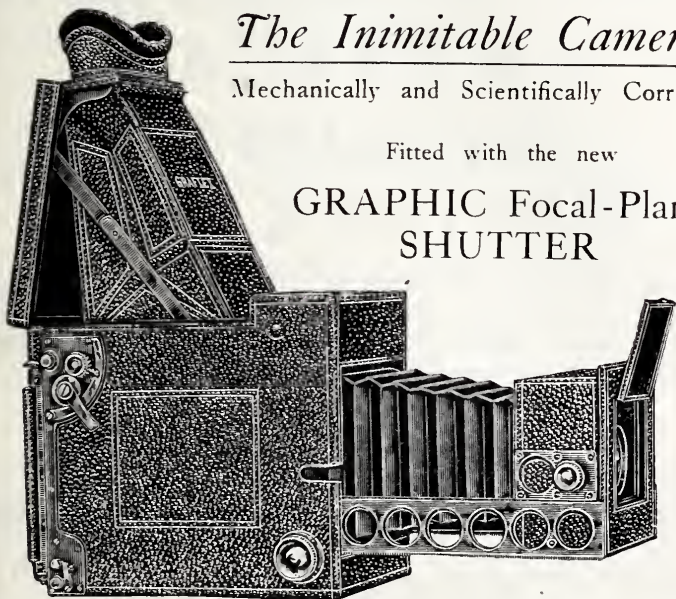
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PICTURES as they are seen; while you see them; at the desired moment; and with the requisite speed. No focusing scale, no judging distances; but one lens and one operation.

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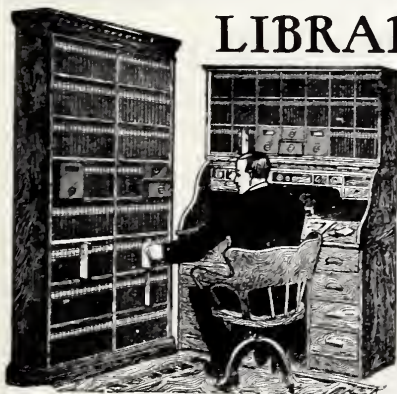


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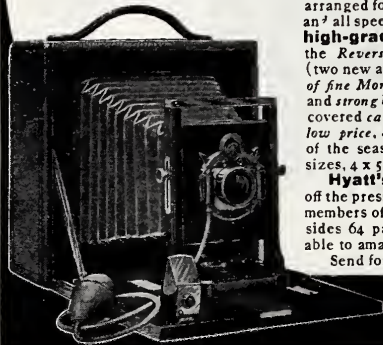
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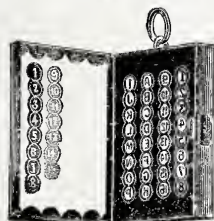
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A Magazine of Photographic Information

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THE KALLITYPE PROCESS

To many readers of THE PHOTO-MINIATURE the Kallitype process will doubtless come as something new and unknown. Let me therefore explain in the beginning that it is nothing more than a simple and inexpensive process which gives prints resembling the familiar platinotype, or the less familiar plain silver paper print. Kallitype paper is not obtainable commercially, but is prepared by the individual worker at his convenience or as required for use. The materials required are few and readily obtainable; the manipulation presents no difficulties likely to trouble anyone who has passed the kindergarten class in photography. In the home preparation of the paper, with the opportunity this affords for the exercise of individuality, in the simplicity of the method and the beauty of its results, lies the charm of Kallitype for those who are familiar with its virtues and vagaries. As a mere method of making prints, therefore, Kallitype possesses little or no interest for the photographer who confines himself to printing papers "obtainable from all dealers," but it appeals with peculiar force to those who have a little leisure and a liking for experiment.

Although comparatively unknown and unappreciated, Kallitype is by no means new. It was foreshadowed by the ingenious Chrysotype process invented by Sir John Herschel in 1841 and, strangely enough, the name "Kallitype" is made from the two Greek words, meaning "beautiful picture," from which Henry Fox Talbot derived the name "Calotype" given to the negative process perfected by him in that same year

1841. The Kallitype process of today, however, is the invention of Dr. W. W. J. Nicol, and dates back only to the years 1889-1891. As first announced by Dr. Nicol, the process was somewhat complex; a few months later the inventor simplified his methods and gave the process the form it has today. Very briefly, the theory of Kallitype is as follows: Paper, coated with a mixture of a ferric salt and silver nitrate, gives, on exposure to light behind a negative, an image in ferrous oxalate and silver oxide which, when a suitable solvent (or developer) of the ferrous oxalate is applied, precipitates an image in metallic silver.

During the years immediately following its appearance the Kallitype process attracted comparatively little attention in Europe. The journals published the patent specifications; the process was discussed at the meetings of the photographic societies; Bothamley confirmed the "findings" of the inventor, and there the matter seemed to end. In America, however, the process awakened a larger interest and many amateurs experimented with it. Dr. O. P. Bennett, of Chicago, gave the method a new lease of life by an article published in *The Photo Beacon*, then, as now, a source of light and leading to thousands of amateurs. W. K. Burton and another demonstrated Kallitype-Bennett before the Photographic Society of Japan, and so Kallitype made its way around the world. Traces of this early interest remain in the trade names *Polychrome*, *Sensitol*, *Platinograph* and *Soline*—all modifications of Kallitype. With the advent of collodio- and gelatino-chloride of silver papers, "gaslight" papers and the growing popularity of platinotype, Kallitype was overlooked or forgotten. Latterly occasional papers on the subject have appeared in American and foreign journals, and there has been a quiet but steady revival of interest in Kallitype. Among the later enthusiasts Mr. Henry Hall, an American amateur, has pursued the method with indomitable perseverance, beginning his experiments with the outline of Kallitype given in THE PHOTO-MINIATURE No. 10, published two years ago. In the following pages Mr. Hall gives his method of working the process, based upon the continuous ex-

perience and reading of these two years. I gladly make room for his monograph in this series, not only because his devotion deserves encouragement, but also because I am sure that many workers in photography will be interested in Kallitype and its possibilities when they are known.—EDITOR

An Ideal Printing Method The amateur photographer who has mastered the preliminaries of negative-making and printing will find an ideal printing method in Kallitype.

That is, when he has learned to expose his plate under varying conditions with a reasonable probability of developing an image that will give a fairly satisfactory print; and when he has learned to turn out a desirable print with the ordinary printing-out, or developing papers; the Kallitype process opens before him a field wide enough for all the skill and selective taste he has acquired, and deep enough for all his chemical lore, with the added attraction that, if the process is taken up with a determination to secure better than average results, his knowledge of plates and papers will be augmented in a thoroughly gratifying degree.

For all Sorts of Negatives I know of no chemical process which will give prints with more pleasing colors than Kallitype, or which will more readily render the values of a wide variety of negatives, hard or soft, by simple changes in the developer. A mere "ghost" can nearly always be made to give a satisfactory print, and a negative so hard that the papers on the market (coated, for the most part, with special reference to brilliant and "snappy" prints) will give nothing but "soot and whitewash," can be made to give detail in high-lights and shadows, without special manipulation or other difficulties.

First Attempts Reading something of this sort in one of the magazines, I became convinced that here, at last, was the Eldorado of the amateur. I therefore invested in a supply of paper and chemicals (the cost of which was a mere trifle), and my initiation to the mysteries of Kallitype began with much enthusiasm, and a confidence which seemed

warranted by previous success in photographic manipulation.

A week later my enthusiasm had lost a good deal of its glow, while my confidence had resolved itself into an abnormally large interrogation point.

It was this way. I had coated the paper carefully according to directions, and had obtained a very promising-looking sheet. The print also appeared to be all right after exposure, the appearance of the image being similar to that obtained in platinum printing, with which I was familiar. Placing it in the developer, I saw with delight the growing image, and was reminded of the bliss experienced in the development of my first plate. But, as I examined it more closely, it proved to be a very foggy specimen, the blacks thin and gray, the high-lights degraded. After trying several sheets with the same result, I very carefully mixed another lot of sensitizer, coated, exposed and—failed as before.

Then began a search for information on the subject. Oddly enough, I missed Dr. Frederick's very clear and detailed account, and found little help until I came across Abney & Clark's "Platinotype," from which I obtained the hints which started me on the road to success. Here I learned to test the chemicals used in the process, and at once found that the chemical salts I had provided were totally unfit for the purpose. I then tried another chemist, and soon had some prints that would hold their own with platinum. Further acquaintance with the process brought me still greater success, and it was not long before Kallitype gave me more satisfactory results than any paper on the market. During the last few months I have explained the process to several interested friends, who have used it with complete success and are now confirmed Kallitypists. My experiments have brought a mass of correspondence which I cannot possibly attend to, but it occurred to me that a simple solution of the difficulty would be to give the desired information in THE PHOTO-MINIATURE. I will, therefore, endeavor to put down each step of the process so clearly that, if the directions are carefully followed, no one need fail to make fine prints from normal negatives on the first trial.

Let me offer a word of caution to those who are not yet familiar with chemical manipulation; the old hands will hardly need it. Absolute cleanliness of hands and utensils must be insisted upon if uniformly satisfactory results are to be expected. In making prints, master one color, preferably black or brown, before trying experiments with the many and charming shades which can be obtained. Develop all the prints first and, when that is finished for the day, attend to the fixing and washing as one operation.

Paper Any of the plain photographic papers will give fine results: Rives, Steinbach, Saxe or those of American make if you can get them. The regular plain papers can be obtained from any of the large stock houses, and a good American paper from John R. Clemons, in Philadelphia. At the same time, a photographic paper is not, by any means, a necessity. In fact, many charming effects, otherwise impossible, may be obtained by the use of the high-grade drawing-papers, as well as from the line of Japanese papers now on the market. Japanese Velum has a smooth surface without the hard appearance of the usual highly calendered paper, but must be carefully sized before sensitizing. A very desirable effect can be obtained by mounting Japanese tissue on heavy paper with dextrine, then coating and developing as usual. The tissue can afterward be detached in warm water, and mounted as desired. Postal cards, ledger-paper and even one's note-heads offer interesting media for Kallitype printing. Necessarily, the different kinds of paper influence the "tone" of the prints obtained upon them.

Glass Positives The process also readily adapts itself to the making of glass positives, at the same time making good use of material usually consigned to the amateur's graveyard. Discarded negatives or light-struck plates may be used, provided that the gelatine film is not scratched or broken. First place the negative in a tray of Farmer's reducer until the silver is completely removed, and only the transparent coating of gelatine is left. Then wash thoroughly and dry. If you do not happen to have at hand the formula

for the reducer, take four ounces of the ordinary hypo fixing bath and add enough red prussiate of potash to give the solution a strong yellow color. When the plate is well washed and dried, place it in the Kallitype sensitizing solution for about two minutes, and when dry it is ready for printing. Printing takes a trifle longer than is required for paper, but the developing, clearing and fixing are the same as for paper prints. The finished positive may be backed with ground glass, or with tissue paper of any desired color, and will well repay the trouble involved in its making.

On the whole, however, it will be advisable for the beginner to use high-grade writing and ledger papers, which are already sufficiently sized and can be sensitized as they are. I would suggest Weston's Ledger, which I use more than anything else. It readily gives fine blacks, has a surface neither rough nor smooth, and a fiber strong enough to stand any amount of handling. This paper has the additional advantage that it is absolutely uniform in quality. Doubtless the British reader will find an equivalent paper in his market. A rather heavy weight should be used, and, as the majority of amateurs use a 5 x 7 camera, I would suggest 36 pound medium, or 18 x 23 inches, which cuts to good advantage, and will be found thoroughly satisfactory.

Sizing
the Paper

With the regular photographic papers, and with everything except writing papers, a preliminary sizing will be necessary. The sizing may be done with either arrow-root or gelatine, 2 grains to the ounce of water.

A liberal supply of sizing solution should be provided, in order that every portion of each sheet may be thoroughly permeated, which will not be the case if the sheets are matted together in a scant quantity of liquid.

The quantity of solution will be governed by the size of the sheet. If one is sizing sheets 8 x 10 inches, not less than 10 ounces should be used, while 16 ounces will be better. With sheets 11 x 14, or 12 x 19, which are as large as can be conveniently handled, not less than 32 ounces of sizing solution should be used. I am aware that sizing can be well done with much smaller quantities than those given; but, unless the

amateur has become expert in this operation, he had better be on the safe side, especially as the cost is slight, while an imperfectly sized sheet will be disastrous in its effect on the finished print.

The average amateur probably has no tray larger than 8 x 10, and possibly not larger than 5 x 8, but it will be a simple matter to make one of the desired size, or have it made at small cost, out of clear white pine or white wood $\frac{1}{4}$ inch thick. A careful job is not necessary; simply see that it is firmly nailed together, and that there are no large cracks. The inside is then thickly coated with melted paraffine, and you will have the use of a large tray without the cost.

The right side of each sheet should be marked on the corner with a pencil (the "right side" is taken up more fully under the head of Coating the Paper). The sheets are slipped into the sizing solution one by one, care being taken to avoid bubbles, which will cause imperfectly sized spots, and the sheets should be turned over, one by one, for about two minutes. If gelatine is used it should be allowed to absorb a sufficient amount of water until thoroughly swelled, and then dissolved by gentle heat. Add to each ounce of solution one grain powdered alum, and half an ounce of wood alcohol (methylated spirit) and filter through muslin, being careful that no bubbles are formed.

In making arrow-root size, rub up the flour to a stiff paste with a little cold water; add the remaining portion of hot water, stirring carefully, and bring to a boiling point, when the solution will become transparent. Add to each ounce of this solution one-half ounce of wood alcohol (methylated spirits) and strain as above.

The sizing is most thoroughly done by immersing the sheets for about two minutes, being careful to break any bubbles that may form. Then slowly draw the sheet out of the solution over a glass rod, leaving the surplus moisture in the dish. The sized paper should now be hung in a warm place to dry. The sizing may also be applied with a clean sponge or brush, but this method will hardly prove satisfactory, except in case of a single sheet for experimental purposes.

Drying Sized Paper Drying the paper after sizing is more or less of a problem. The sized sheets may be simply pinned up on a cord stretched across the room near the ceiling, and if pinned by two corners will dry in fairly good shape. A more satisfactory result will be obtained by proceeding as follows: For the top and bottom of each sheet, a broad clamp, the full width of the sheet is made with thin strips of wood and strong metal clips, such as are used in most offices. One clamp is then fastened to the cord previously mentioned, and the other will keep the sheet from curling.

As the sizing has a tendency to settle on the lower end of the sheet, it may be advisable, with very soft and previously unsized papers, to repeat the sizing, bringing to the top that end of the sheet which was at the bottom in the first drying, which with slight extra trouble will result in an evenly sized sheet.

Sensitizer The basis of Kallitype, as with platinum-otype, is ferric oxalate. In fact, there is much in common between the two processes, the chief difference being that in one case platinum forms the photographic image, and in the other, silver. The quality of the ferric oxalate has much to do with success. It should form a perfectly clear amber solution, and should show no trace of blue when a weak solution of ferricyanide of potassium is added to a small portion. It should come in shining brownish scales, which should not be matted or decomposed in the slightest degree, and, if found in this condition, should be returned to the maker at once. Do not buy it in solution. In fact, the chemists who supply the larger part of the ferric oxalate used in this country will not sell it in solution, as it has a tendency to decompose. Therefore the amateur will do well to buy only one ounce at a time. This should be dissolved entire in the proper amount of water, as it is safer in solution than in the dry form after the bottle has been once opened, and will yield satisfactory prints for perhaps six months if kept tightly stoppered and in the dark.

If the paper were coated with plain ferric oxalate and

silver, a good print might result from a perfectly normal negative; but, as most plates are abnormal, there is a decided advantage in adding other chemicals, which will give the coating a much wider range, and enable one to get a satisfactory print from all kinds of negatives. The reader must not, however, imagine that he will find in Kallitype an open sesame for all his difficulties; or that by reading a few directions he will at once be able to mix coatings that will give him Salon prints from plates that have received scant exposure or insufficient development.

Still, if he will master the coating for negatives that will give a reasonably good print by other processes, he will gradually acquire the experience that will enable him to get a print from anything that he can see on the negative, good or bad.

**Sensitizing
Solution**

Distilled water should be used in making the sensitizing solution. The cost is slight, and it can be obtained at any drug-store. It is also absolutely safe, while well or cistern water, even when boiled and filtered, is apt to contain chemical impurities which will have an injurious effect on the sensitive coating.

In addition to the distilled water, we will need 1 ounce of ferric oxalate; 1 ounce of ferric oxalate and potassium; oxalic acid; gum arabic (picked); and bichromate of potassium, as hereafter indicated.

Having procured the necessary ingredients, proceed to make up, by lamp light or yellow light, the following *Stock Solutions*. This will be simpler than weighing small quantities each time. With these at hand (the solutions will keep indefinitely, with the exception of the ferric oxalate, which is good for several months) it will be an easy matter to mix the sensitizing solution in any desired proportion as desired for use.

Stock Solution A—Ferric oxalate, 1 ounce; distilled water, 5 ounces; gum arabic (picked), 48 grains.

Place the water in a chemically clean, deep orange glass bottle, preferably one with a glass stopper, and add the ferric oxalate. Shake slightly four or five times at intervals of five minutes, and put away in the dark for twenty-four hours, when the oxalate will be found

to have dissolved leaving a perfectly clear amber solution, to which the gum arabic should be added, reversing the bottle a few times, when it can be put away for use. If there is need of haste, a coating can be made at once, as the office of the gum is chiefly to prevent the coating from sinking into the paper, of which there is little danger if ledger paper be used.

The ferric salt can also be dissolved "while you wait," by placing the bottle in a water bath, and keeping it just below the boiling point; but there is the danger that the heat may turn the *ferric* to the *ferrous* oxalate, which is useless for our purpose. It is therefore safer for those not expert in chemical processes to take the slower and surer method.

With this solution, as well as with those immediately following, a chemically clean bottle is of the utmost importance. As this point should be given attention in all photographic manipulation, a word or two of explanation will not be amiss.

There are two cleansing agents which every amateur should have at hand: caustic potash and hydrochloric acid. Both should be carefully handled, as they attack the skin or the clothing if given opportunity. The first is a solvent of grease or fatty substances, and the second will render soluble every other substance that the amateur will be likely to use. He will have only an occasional use for caustic potash, but the hydrochloric acid will be of general use. The commercial article, "muriatic acid," will do, and is very cheap. After developing plates, the tray should be rinsed with water, and then partially filled with the acid, rocking the tray carefully to make sure that the entire inner surface is acted upon, when the acid can be poured into a bottle for future use, and the tray thoroughly rinsed in water. The acid can be used repeatedly, and its use will render clean trays an absolute certainty.

To return to our bottles: the bottle should be given a rinsing in a small quantity of caustic potash, one part acid in four parts water, to remove any suspicion of grease that may be present. It is then rinsed once or twice, and partially filled with muriatic acid of the full strength, and not previously used. The bottle is

now stoppered, and carefully reversed from end to end, until every portion of the interior is fully acted upon by the acid. After a minute or two the acid is poured into another bottle for future use, the bottle is thoroughly rinsed in clean water and given a final rinsing in distilled water, after which it may be considered as chemically clean.

Stock Solution B—Ferric oxalate and potassium, $[\text{K}_3\text{Fe}_2(\text{C}_2\text{O}_4)_3]$ ½ ounce; distilled water, 8 ounces.

In mixing this solution, no special care is needed. Just add the salt to the water, reversing the bottle occasionally, when it will soon dissolve, leaving a clear, yellowish solution. Should there be any difficulty in dissolving all the salt, which may happen in cold weather, the bottle may be slightly warmed, when it will quickly dissolve. It should be kept from white light in deep orange glass bottles.

Stock Solution C—Oxalic acid, ½ ounce; distilled water, 4 ounces; stronger ammonia water (Ammonia Liq. '880), 100 minims.

Here, again, considerable care is necessary. The temperature of the acid solution must not be below 70 degrees Fahrenheit, and it can safely be as high as 80 or 90 degrees when adding the ammonia. The ammonia is put in slowly, a few minims at a time, agitating the solution slightly after each addition. If the operation has been carefully performed, the solution will be perfectly clear, when it should be filtered by means of the regular filter paper. It will keep indefinitely. In cold weather a few crystals will form, but these can be dissolved by gentle heat before using.

Stock Solution D—Bichromate of potassium, 120 grains; distilled water, 4 ounces. This solution requires no special care in mixing, but should be kept in the dark.

The stock solutions having been made ready, it will be well for a first attempt to make up not over 120 minims of sensitizer, so that if it should go wrong, the loss of time and material will be slight. After we have gained experience a larger quantity may be made up, care being taken that the same proportions are kept. Sensitizing solution for average negatives: *Solution A*,

1 ounce; *Solution B*, $\frac{1}{2}$ ounce; *Solution C*, 30 minims; *Solution D*, 4 drops.

Of the above, take 120 minims and add six grains nitrate of silver, stirring with a glass rod until wholly dissolved. We should thus obtain a perfectly clear liquid exactly in appearance as before the silver was added. Should the solution show more than the slightest trace of cloudiness (if everything is just right, it will show none at all), or if a precipitate forms, there is a strong probability that the silver contains free nitric acid, which will weaken the image as well as cause dingy whites in the resulting print. But if a reliable brand of nitrate of silver is used, it will be reasonably probable that any precipitate will be caused by failure to closely follow the directions given.

The sensitizing or coating solution having been made ready, it should be used at once, as it will begin to deteriorate within a few hours.

This mixture above given is designed to give the fullest possible rendering of an average negative, or of one with a tendency toward hardness. The resulting print should be free from bronzing in the shadows, which is more or less a characteristic of Kallitype and platinum papers when used with hard negatives.

In some cases, however, it may be advisable to make slight changes in the formula given. For instance, if we have a negative with dense high-lights and clear glass in the shadows, we will get a better print by leaving out *Solution D*, and increasing the proportion of *Solution B* and *C*. The quantity of *Solution B* can be doubled without ill effects, and if this is done another grain of silver should be added. It will not be safe to increase the amount of *Solution C* by more than 20 per cent, as fogging will be apt to result.

On very thin and soft negatives it will be found helpful to increase the proportion of *Solution D*; in aggravated cases, double the quantity may be used, and at the same time reducing the quantity of *Solution C* by one-half or more. As a rule, however, it has been found possible to get thoroughly satisfactory results from a wide range of negatives with the coating given by care in printing and developing.

**Coating
the Paper**

To one who has never tried it, the operation of properly coating a sheet of photographic paper may seem to be a somewhat formidable task. It is in reality one of the simplest details in the Kallotype process. The work must, of course, be carefully done, and, as there are certain precautions to be taken if full success is to be attained, it will be well to present a somewhat detailed description of the operation.

Having selected the paper, say Weston's twenty-eight pound or thirty-six pound medium (18x23 inches), it should first be cut in half, making a sheet 11½ x 18 inches, which makes a more convenient size for coating, and then laid right side uppermost. It is important that the coating be applied to the "right" side, as otherwise the sieve-like marks of the dandy roll will show unpleasantly in the finished print. In Weston's Ledger the right side can be ascertained by looking through the paper toward the light, when, if the water-mark reads "right" the right side is toward you. In some other American ledger papers, Advance Ledger for instance, which is largely used by draftsmen for making blue-prints, this rule is reversed and the water-mark will read backward when the right side of the paper is toward you. As a rule, however, it will be easy to tell the wrong side by looking across the paper toward the light, when the sieve-like marks can be seen.

The paper being ready, a sheet is fastened at three corners with push pins to a smooth pine board, a trifle smaller than the sheet each way, after which it is ready for coating.

For applying the coating we need a flexible brush. Some workers fold a piece of Canton or cotton flannel over a 4 x 5-inch plate, which answers fairly well; but, as it is possible that the unyielding pressure may rub the coating into the body of the paper, thereby causing a degradation of the image in the finished print, it is advisable to make a brush that will be absolutely safe. For this take a piece of celluloid film (negative film answers admirably), not less than three inches and not more than four inches wide, and about three inches

long, and three thin strips of wood or heavy cardboard one-half inch wide and a trifle longer than the width of the film. Bring the ends of the film together, with one of the strips between them; punch three holes with a brad-awl (one hole in the center and one at each end), and fasten the ends of the film to the strip with thread. This gives us a foundation for a flexible brush which will last a long time and can be easily renewed. Now take a piece of single-faced Canton flannel, cut to the same width as the strips forming the handle of the brush, and fold it over the film, with the nap or fleece outward; place one of the remaining strips on either side and pass a rubber band around the ends of the strips and the brush is complete. A fresh piece of flannel should be used with each coating, as it is important that the surface of the paper should not be roughened or abraded.

The sheet of paper being now fastened to the board, brush in hand, pour from a minim glass or graduate a small quantity of the sensitizer on the middle of one end of the sheet. Fifteen or twenty minims will be about right, and it should be quickly and lightly spread with a circular motion of the brush, working it into the corners, and then drawing the brush lightly across the sheet from side to side and from end to end, until the paper is thoroughly coated. Ten or fifteen minims will be necessary for the remaining portion of the sheet, which should be treated in the same way. When the operation is thought to be complete, look across the paper toward the lamp, with the eye nearly on the level of the sheet, and any imperfections in the coating can be readily detected and remedied. It is then laid to one side, or pinned up by one corner, while a second sheet is being coated in the same manner. By this time, if the room is fairly warm (coating should be done in a warm room), the first sheet will be surface-dry, when it should be quickly made "bone-dry" over a lamp or stove, being careful that it is subjected to no greater heat than the hand will comfortably bear. When thoroughly dried so that the paper will crackle when shaken, the operation is complete, and the sheet should have an even coating of a pale lemon-yellow color.

There are two important points to be emphasized in coating the paper: first, the brush must be very lightly used, and second, the paper must be thoroughly coated. It is better to use too much of the solution rather than too little. The only danger in using too much is that the coating may soak into the body of the paper, causing difficulty in thoroughly clearing the chemicals not used in forming the image, and thereby endangering the permanency of the prints. This danger, however, will be minimized by extra care in developing, clearing and washing. On the other hand, if too little solution is used, even though the finished print may appear to be perfect, in time the thinly coated places will plainly show the marks of the coating brush. It will, therefore, be well to use plenty of the sensitizer,—at least 30 minims, and not more than 40 minims for each sheet 11 1/2 x 18 inches.

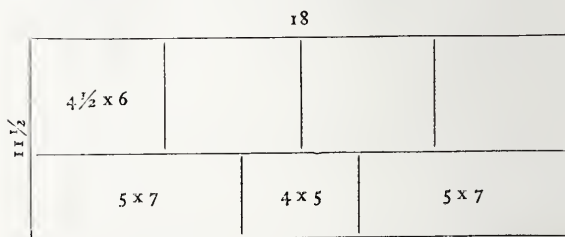
In very rare instances, when one has a very thin negative, a thin coat may be quickly applied and quickly dried, followed by a second coat, which should also be quickly dried.

It should also be noted that, as a rule, the paper should not be too quickly or too slowly dried since if it is too quickly dried the coating may "fall off" in the developer before the image is formed; while if too slowly dried the coating will sink into the paper, making it difficult to thoroughly clear the high-lights in the prints. A warm room and a careful observance of the directions given will relieve the worker from any worry on this point and insure success.

Cutting and Storing Paper After the paper has been coated and dried it may be cut to convenient sizes and, if to be used within a month or two, can safely be stored in old plate-boxes. When the worker has become successful with the process and desires to make up a supply for future use, it can be kept in good condition if packed in tin boxes or tubes and hermetically sealed. At the same time, I might add that in November I received a letter from an amateur in Minnesota, stating that he had just used paper coated early in the previous May, with the formula given here,

and had obtained results identical with those given by the freshly coated paper, although it had been stored in plate-boxes without any precautions whatever.

The cutting of the paper will be simplified if a form is made from an old negative, after cleaning off the emulsion. Having selected a glass with straight edges, a handle may be made by attaching to the center a large cork, with strong glue, or with any of the cements sold in the drug-stores. Then paste a strip of paper $\frac{1}{2}$ inch from one end and side, and you have a form that will make it a simple matter to mark off the $11\frac{1}{2} \times 18$ sheet according to the following diagram, making two 5×7 inches, four $4\frac{1}{2} \times 6\frac{1}{2}$ inches and one 4×5 .



The paper can then be readily cut as marked, and, as the critics tell us that few plates are worth printing the full size, the suggested sizes will probably be found to be about right, unless one desires a broad white margin for the print.

The color and general character of the The Developer print depends, in a large measure, on the composition of the developer. With the normal coating, it is possible to secure almost any tone from a blue-black to a yellow-brown, simply by modifications of the developer, while with some negatives a particular form of developer will give the most satisfactory results.

At the beginning, however, it will be advisable to take one developer and stick to that until it is mastered, simply varying the printing and the amount of bichromate (Solution D) in order to obtain the desired effect. Later on, those inclined to experiment will find that



By W. H. Crocker



By W. H. Crocker

many of the citrates, formates, oxalates and acetates will develop an image, and that a different color will be given by each modification.

Acetate of Soda

This is probably the most energetic developer (that is, it will give a stronger image with a shorter exposure than any of the others), and it will also give a fuller rendering of the negative. Used alone, in the proportion of 1 : $7\frac{1}{2}$, it gives a cold engraving black, very pleasing for some subjects, but must be followed by a bath of potassium oxalate, 1 : 8, to clear the iron salts. Even then it is difficult to get perfectly clear whites, as the acetate has a tendency to precipitate the nearly insoluble basic salts of iron. It is therefore a safer plan to make the solution slightly acid, when the paper will be found to clear perfectly, while the tone is slightly warmer and more pleasing for the majority of subjects. On the whole, the following seems to be the best developer for general use: *Acetate of Soda Developer*: Acetate of soda solution (1 : $7\frac{1}{2}$), 8 ounces; tartaric acid, 12 grains; Solution D (q. s.), 10 to 100 minims.

It will be found convenient to mix up a quantity of the acetate solution, as it works better after it is forty-eight hours old. The bichromate of potash forms an important part of the developer, serving: First, as a restrainer, similar to bromide in plate development; second, as an assistant in obtaining black and blue-black tones.

As a restrainer, it will be well to study carefully its possibilities. With a fairly normal negative, a moderate exposure with a small quantity of bichromate will give a soft and pleasing print with a warm black tone. A longer exposure with an increased amount of bichromate will give a snappier print, with a blacker, or bluish black tone. With "contrasty" negatives, a better print may result by leaving out the bichromate, or by adding only a drop or two, while with "flat" negatives the amount of bichromate should be correspondingly increased. Perhaps the worker will more quickly obtain a clear idea of its use by mixing several lots of developer, say, one ounce without Solution D, and one each with five, twenty, and fifty drops respectively, and

then developing a print in each, the prints to be from the same plate, and as nearly equally printed as possible.

Black Tones

Should we desire a blacker tone than that given by this formula, we can use the following: *Developer for platinum black tones*—Acetate of soda solution, 1 : 7½, 4 ounces; tartaric acid, 10 grains; phosphoric acid, 50 per cent, 10 minims; Solution D, 10 to 50 minims. If the amount of phosphoric acid is increased to 30 minims, a fine blue-black tone will be secured.

Next in general value, and preferred by the majority of workers, is the *Borax and Rochelle Salts Developer*. This, as its name indicates, is composed of borax and Rochelle salts in varying proportions. Perhaps the most convenient formula is that given by Doctor Frederick, in *The Camera*, September, 1901, from which I quote:

Solution for Black Tones—Hot rain-
Frederick's water, 1 quart; powdered borax, 1¼
Formulae ounces; Rochelle salts, 2½ ounces.

First dissolve the borax in the hot water, cool and then add the Rochelle salts.

Solution B, Sepia Tones and Clearing Bath. Rochelle salts, 2½ ounces; rain-water, 1 quart. For sepia tones use one ounce of A and three ounces of B, using restrainer as for black tones. Various shades of brown can be obtained by varying the relative proportions of A and B.

With the preceding formula it is possible to get very pleasing brownish blacks, but I have never been able to get a genuine black with it. Possibly this may be a confession of weakness on my part, but I know of other workers who have experienced the same difficulty. The following formula will, however, with fairly normal negatives, give something approaching very nearly to a true black: Borax, 1 ounce; Rochelle salts, ½ ounce; ammonium acetate, 40 grains; water, 12 ounces; Solution D, 50 to 150 minims.

Dissolve in the order named, using hot water for the borax. This bath works better if made at least forty-eight hours before using, and can be used repeatedly until exhausted.

After the print has been fully developed, the iron and silver salts unaffected by the light in printing must be thoroughly removed if permanency is to be assured.

The clearing bath must be depended upon to render the iron salts completely soluble, so that a moderate amount of washing will readily remove the last traces from the paper, while the fixing bath must perform the same office for the silver salts.

If the acetate developer is used, the following bath seems to do its work in a satisfactory manner: Sodium citrate, $\frac{1}{4}$ ounce; citric acid, 20 grains; water, 8 ounces.

This bath should be mixed fresh each time. If only a few prints are made, one-half the quantity specified will be sufficient; but it is well to have plenty of solution so that the prints will not become matted together, when imperfect clearing, and consequently, fugitive prints will result.

If the borax and Rochelle salts developer is used, it should be followed by the clearing bath suggested by Dr. Frederick, from whom I quote:

"In tray or dish, place four ounces of the following solution: Rochelle salts, $2\frac{1}{2}$ ounces; rain-water, 1 quart; bichromate solution (Solution D), $\frac{1}{4}$ ounce. The excess of bichromate arrests the action of the developer, and prints should remain in it for at least five or ten minutes, and then be thoroughly washed before toning or fixing."

After the print has been carefully developed, thoroughly cleared, and as thoroughly washed, we may assure ourselves that it is in satisfactory condition with the exception of the unreduced silver salts, which must now be rendered soluble by the fixing bath, or perhaps more accurately speaking, the un-fixing bath, the office of which is to assist the silver salts in readily combining with the water used in the final washing, and thus be completely removed from the paper, leaving only the metallic silver which at this stage forms the picture image.

For this purpose, some authorities suggest the following: Stronger ammonia (liquid ammonia '880), 60 min-

ims; water, 10 ounces. But I have not been able to secure with this bath prints that would maintain the purity of their whites for half a day in strong sunlight, and, therefore, can hardly recommend it. The following bath seems to render it possible to remove the last traces of unreduced silver: Hypo, 1 ounce; water, 20 ounces; stronger ammonia, 120 minims.

Few things have more to do with success in the Kallotype process than the proper exposure of the paper under the negative. It is an exceedingly simple matter to so print a sheet of paper with a normal negative that a brilliant and snappy proof will result. This will be readily learned after a few trials, if not accomplished at the first attempt. But many of our negatives, unfortunately, are not normal, and, with the regular photographic papers, will persistently refuse to yield a print that we can show to our critical friends with any degree of confidence or of composure, although we may feel that there lie hidden within the film many desirable qualities.

In such a case, Kallotype becomes a boon to the amateur. A longer or a shorter exposure, a print in sunlight in thirty seconds, or an exposure of two hours in the shade, will render possible totally different effects from the same negative. In the limited space I have here it is, of course, impossible to do more than suggest; but, with the assistance of a few pointers, and the liberal use of "gray matter," the reader should readily learn to adapt his printing to the plate in hand.

Making First, it may be suggested that all
Prints prints should be masked. There are
several reasons why this should be done.

It is well known that successful workers seldom print the full plate. It has also often happened that the hanging committees of the larger exhibitions have rejected prints which would have been hung without question had they been trimmed so as to conform to the rules of spacing, balance and unity. In this connection, those who have not already done so will find many valuable suggestions by reading Mr. McFarland's very apposite remarks on trimming, etc., in THE PHOTO-MINIATURE No. 20.



THE TOWER: MADISON SQUARE GARDEN, NEW YORK
Negative made with a No. 10 needlehole
James H. McCorkle



A GLIMPSE OF THE "FLATIRON" BUILDING, NEW YORK

Negative made with a No. 10 needlehole

James H. McCorkle

Again, if a mask is placed between the negative and the paper, there will be no danger of marking the film with the finger-nail when raising the end of the print for examination as to the progress of the printing. But, with special reference to this process, perhaps the more important reason is that you have at all times an unexposed margin to the print, which will materially assist in judging the progress of the printing, especially when printing from thin negatives. It will also be a sure guide in developing and fixing, as this white margin should be clear before leaving the developer, and should be absolutely of the normal color of the paper when removed from the fixing bath for the final washing.

In damp or rainy weather it is well to have plate, paper and printing frame thoroughly dry, as dampness has a tendency to render the image less visible, and in the earlier trials the conditions should be as favorable as possible. It will be well, also, to back the paper with a sheet of rubber cloth or press board, as is sometimes done in platinum printing; although, later on, when familiar with the process, no especial care in this direction will be found necessary.

Having taken for the first trial a negative that has readily given satisfactory prints by other processes, expose in sunlight for one minute, and then, well away from the light and with your back toward it, examine the paper. If the negative is of moderate density, the shadows and half-tones should show a faint purplish color, while the high-lights should be still unchanged. Unless the general outlines are plainly in evidence, the frame should be returned to the light for longer printing.

Those who are familiar with platinum printing will recognize the characteristic appearance of the proof, and will simply stop the printing while the image is considerably less visible than with platinum paper. The visibility of the image varies with the character of the negative; a very thin negative will be fully printed before the outlines are well defined, while a plucky negative will require a tinge of color throughout except in the densest high-lights. The proper depth of print-

ing will be learned after a trial has been made with the developer, and correction can be made with the next proof if necessary. It is a good plan to take some particular portion of the proof as a key; for instance, a high-light against a half-tone. When the half-tone is barely tinged, the printing will be about right. It should also be kept in mind that with the acetate developer, a somewhat less visible image is necessary than with borax and Rochelle salts.

After having become sufficiently familiar with the process to turn out a good print from an average negative, it will be in order to try something more difficult. Every amateur has among his treasures at least one negative that is dense enough in the high-lights and thin enough in the shadows to cause him lots of trouble in printing; some have several. Perhaps it will not be advisable to take the most aggravated case for the first trial, but one of the sort with which the gum worker demonstrates the superiority of his process, or one which shows bronzing in the shadows when printed with platinum paper.

This sort of negative should be printed in the shade, and the more aggravated the case the longer the printing should be. As a rule, slow printing, which means an exposure of one-half hour or longer, with little or no restrainer in the developer, will give a satisfactory print from a very contrasty negative. If this fails and the plate is worth it, a special coating should be made according to the suggestions previously given, and the same method of printing followed. It will, however, be an exceedingly hard negative that cannot be made to give a good print from the formula as given.

While we are on the subject of hard negatives, I would like to mention a very simple method of improving the printing quality of them. Thoroughly clean the glass side of the negative, and, having carefully leveled it, coat with a bichromated gum or gelatine solution similar to that used by gum workers. In my own work, I use a high-grade carpenters' glue, costing about 20 cents (10 pence) per pound, and have had better

success than with gum. There need not be any special care in the mixing, it being simply necessary to coat the glass side of the negative with some colloid substance in which there is sufficient bichromate of potash to make it sensitive to the action of light, and also give it a pronounced yellow tone, which we need to mask the shadows for us in printing.

Take a half-ounce or so of the glue, and soak it in all the water it will take up. When the glue is swelled and will take up no more water, pour off the surplus water, melt the jelly with gentle heat, and add sufficient bichromate to give it a strong yellow color. It is now ready for use. Pour the solution on the center of the leveled plate and spread evenly with a glass rod. When the glue has set, it may be quickly dried over a lamp, being careful not to apply sufficient heat to injure the negative film. Place the negative in the printing frame with the film side out, and back it with black cloth. Print in sunlight for five or ten minutes, according to the strength of the light, and then develop with warm water. If the printing has been anywhere near correct, you will have in a few minutes a positive with clear glass over the high-lights and a coating of yellow over the shadows of the negative, and will find that a much-improved print will result.

This explanation may make the process seem somewhat complicated, but it is in reality very simple. On my first trial, which was made when I was a beginner with the camera, I met with complete success, although I had no data to work with, except the fact that bichromated gum was made insoluble by the action of light, and that a yellow color would retard the action of light in printing. The value of the negative is not affected in the slightest degree, as the coating can be readily removed with hot water if not satisfactory, care being taken, of course, that the negative film is not injured in the handling, which may be avoided by giving the film a coating of any of the negative varnishes to be had from the stock houses. Varnishing, by the way, is too much neglected by the amateur. It is practically a necessity if one wishes to keep the film of the negative intact for an extended period. In looking over almost

every collection of unvarnished negatives, one will find metallic stains that come from the paper used in printing. This may be completely avoided by varnishing the negative, and if by any accident the varnish is scratched or otherwise injured, it may be readily removed with alcohol, and a fresh coating applied. If it is desired to keep a negative intact for an indefinite period it should certainly be varnished, and, as it requires considerable care to secure a perfectly even coating that will not show in the printing of thin negatives, those who have never tried it will welcome a suggestion.

The negative is first warmed about as hot as the hand will bear, and the surface freed from all particles of dust by a gentle wiping with a soft cloth. It is then balanced on the thumb and fingers of the left hand, and, with the bottle of varnish in the right hand (the lip of the bottle having been carefully wiped), a pool of varnish is poured on the plate, and by slightly tilting the plate is first flowed to the left-hand corner nearest you; it is then flowed along the left-hand side and along the farther end; then along the right-hand side until it reaches the end nearest you, when the plate is sharply tilted, and the surplus varnish is poured into the bottle, rocking the plate rapidly. The plate is then held slantwise over the lamp, keeping up the rocking motion until the varnish has set. It will be found quite simple.

Another sort of negative requiring
 “Ghostly” care in the printing is the “ghost,” the
 Negatives kind that must be held aslant in order to see the image. A plate of this character, if fully exposed but under-developed, can generally be improved by intensification. If originally under-exposed, intensification will simply make matters worse, as the highlights alone will be built up, making the negative still more refractory. Having decided to make a trial with a very thin plate, the printing should be done in the shade. This is, of course, contrary to the usual theory, but if the print is developed with a considerable excess of restrainer, it will be an exceedingly thin negative that will fail to give a fairly satisfactory print, and, in many instances, a very fine one.

It might be well to add a word of caution as to the printing of thin plates in general. Do not print in summer sunlight in the middle of the day if you wish to be sure that your prints will be permanent. I have a negative that prints in two minutes in February, and in fifteen seconds in June. The February prints are two years old, and are in perfect condition; the June prints began to go inside of two months. The moral needs no emphasis.

In developing Kallotype two things are important: the surface of the print must be quickly and completely covered, and the development must be thorough. Not less than eight ounces of solution should be used, unless only one or two prints are to be developed. It should be in a wide-mouthed bottle or a graduate, in order that the print, having been laid face up in the tray, may be quickly and surely flooded with the developer. In this way, there is little danger of bubbles being formed on the surface of the print, and if any should be found, they can be instantly broken by pouring the developer on them. It is important that all bubbles be promptly broken, otherwise they will show on the finished print, and if any should appear after the developer has been poured, a touch of the finger will make things right.

After the developer has covered the print, the image will promptly make its appearance, first in the deeper shadows, and then in the half-tones, weak at first, and rapidly strengthening, until in a minute or two the print may be taken in the hand for examination. If the exposure has been approximately correct, we can now have a pretty good idea as to how the finished print will appear. The high-lights may be blank paper, and the finer detail in the half-tones be missing, but this will be remedied by returning the print to the developer, and awaiting its completion.

If too long an exposure has been given, the entire surface, including the high-lights, will be darkened; and the print should be at once transferred to a tray of water, where it may or may not be saved, this depending on whether the over-printing has been excessive. If only moderately over-printed, no harm will have been done,

except that extra care must be taken in the subsequent operations in order to make sure that the un-reduced or but partially reduced metallic salts are completely removed from the paper.

About Over-
Exposure

And right here, practice, assisted by familiarity with the possibilities of the process, is of great value. With Kallitype, over-printing is not an unmixed evil: in many cases, it is almost a necessity. Some of my most pleasing prints have been printed out, given ten seconds in the developer and finished in water. Others have been printed out and developed in water only. Still others have been started in water, and finished in the developer. The beginner will first learn to recognize a normally printed proof; he will then know an over-printed proof on sight, and will modify the development accordingly. He will bear in mind the fact that very thin negatives, and very flat ones, may give better results by printing-out, followed by development in water, or in water followed by developer, or vice versa, as indicated. It will be noted, however, that with water-development, the tone of the print will be more or less like that of an untuned Solio print when wet, and it may be found necessary to modify the color, which can readily be done by means of the toning baths given later on. A few trials in this direction will convince him that photography is not quite as mechanical as some people would lead him to believe, and he will have the added satisfaction of securing pictorial prints from plates that he had thought to be unprintable with ordinary printing papers.

Duration of
Development

I might add just a word as to the duration of the development. Most authorities agree that it is impossible to over-develop Kallitype, and, barring the modifications previously given, this agrees with my experience. In other words, I believe that a normal negative, normally printed, cannot be over-developed. This implies that the coating has been properly mixed in the proper proportions, and that no actinic light has reached it except through the negative. If, however, the ferric oxalate has in it a suspicion of ferrous salt, or if the

coated paper has been dried with too great heat before it was surface-dry after the coating, or if any extraneous light has reached it, there is no doubt that prolonged development will result in a degraded image; and this is probably what Dr. Frederick has in mind when he says: "As usually described, you are instructed to place the print in the developer and allow it to remain until cleared,—say ten or fifteen minutes. This is wrong, for you not only obtain a sunken-in appearance, but in this way you get the deposit of basic oxide of iron that is so objectionable."

This has not been my experience. My coating solutions are kept in brown bottles in the dark; the coating is done at night, and several feet from a kerosene lamp; the drying is done by heat without light; during printing, the proofs are examined by the dullest daylight that I can find; the developer is kept in brown bottles, and the developing is done by subdued light, the tray being shielded from the window by a screen, and covered by cardboard except when developing a print. I use 16 ounces of developer, and if developing more than a half dozen 5 x 7 prints, a second tray is used with another 16 ounces of developer. When developing is done for the day, the prints first developed are well rinsed and transferred to the clearing bath, and the balance follow half an hour later. My prints have been shown to critics of discernment, and while they have been pretty well rapped for faults in line and balance and spacing, I have heard nothing about a sunken-in appearance, or deposits not directly concerning the making of the prints. However, if the reader will make all his prints with the least bit of white margin around them, the margin will tell whether the print is "guilty" or "not guilty."

A Trial Balance After having developed a proof that seems to have been printed to about the proper depth, it should next be closely examined in order to decide whether the general result is about right, or too contrasty, or too flat. If the high-lights are not degraded, and if the half-tones show good gradation, it may be assumed that the composition of the developer is satisfactory. But, if the high-lights are

merely white paper, and if the half-tones are weak or altogether lacking, it is evident that less of the restrainer (Solution D) should be used, unless longer printing will improve it. If, on the contrary, the highest lights of the print are grimy, and if the print in general has an appearance of flatness and lack of vigor, the proportion of Solution D must be increased. It is rather a difficult proposition to make the matter entirely clear in cold type; but if the worker will keep in mind the general principle that excess of the restrainer tends toward hard prints, and the lack of it toward soft ones, he will have little difficulty in deciding upon the proper amount.

The worker will also bear in mind the fact that the tone as well as the general effect of his prints will be radically modified by the use of one or the other of the two classes of developer given. For brilliant, snappy prints of a rich warm tone, he will use the borax and Rochelle salts; but if he desires a colder and less assertive tone, with full detail in the half-tones, he will use the acetate developer.

Prints that are noticeably under-printed may as well be destroyed, as there appears to be no way of intensifying Kallitype except in an exceedingly slight degree. Those which have been too deeply printed may be saved for further trials in toning and intensification, as explained later on.

Clearing the Prints When the prints have been developed they are, after a slight rinsing, transferred to the clearing bath indicated for the developer used. They should remain in this bath for at least half an hour, being turned over occasionally in order that every portion of each print may be acted upon by the solution. The object of this bath is to render the iron salts entirely soluble, so that they may be readily removed in the subsequent washing. Occasionally, in the clearing bath following the acetate developer, the prints show a slight loss of strength, which is probably due to superficial printing, and it will be well to try one print for a few minutes before adding the remainder. If, on trial, the print shows signs of weakness, an increase of 10 per cent in the amount of



A NIGHT IN JANUARY
Negative made by the light of the moon
James H. McCorkle



MID-WINTER
James H. McCorkle

citrate of potash will remedy the evil. Thorough printing is the key to the situation.

After the prints have been in the clearing bath for a half hour or so, the white margins should be sparkling white, and they will be so if the preceding operations have been properly performed. They should then be transferred, one by one, to a tray of clean water and given several quick changes, when they may be laid in an even pile on a glass plate or other smooth surface, and well rolled with a squeegee roller. If the operation of rinsing and rolling is repeated three or four times, the prints may be considered as sufficiently washed, and are then ready for fixing.

Fixing the Prints A plentiful supply of fixing solution should be provided, and the prints should be transferred to it one by one, and should be kept moving. At the end of five minutes they may be examined to see if any of the prints from very thin negatives show any signs of weakness; and if so, these may be transferred at once to the washing tray, which will, of course, be used for nothing else in the making of Kallotype prints. At the end of ten minutes the prints may be considered as sufficiently fixed, and will then be given several changes of water, followed by rolling, as described under the head of Clearing, and when this operation has been repeated three or four times the prints may be safely dried.

Drying After the last squeegeeing, the prints may be laid out on clean newspapers until dry, or they may be laid between blotters, which is the safer plan, as the prints are protected from any particles of dust that may be floating in the air.

The regular photographic papers, as well as the superfine writing papers, will dry perfectly flat between blotters; but the Bond and Ledger papers, as well as the better grade of drawing papers, are apt to cockle and show a somewhat uneven surface when dry. This will not show when the prints are mounted, but as I keep many of my prints unmounted, I have adopted the following plan to get perfectly flat prints: I have a plentiful supply of clean glass from old negatives, and some

pieces of heavy blotter cut to the same size. When the prints are ready for drying I lay down a glass, then on the glass a blotter, then a damp print, followed by another blotter and a glass, and so on until the prints are disposed of. A flat-iron on top of the pile completes the job, and I can turn my attention to something else with the assurance that when the prints are dry they will be flat.

After-Treatment We have now formed a slight acquaintance with the various operations of the Kallitype process, from the plain paper to the drying of the print, and, with the aid of the suggestions offered, the average amateur should soon be able to equal his best work with the ordinary photographic papers; and, if he takes up the process thoughtfully, he will get better results from many of his plates than have before been possible. I feel quite positive on this point, because this is the experience of those to whom I have given suggestions in regard to the process.

Now, the average amateur is apt to stop right here. I am not quite sure whether it is lack of interest, or a dearth of information, which causes so many amateurs to show prints that might be easily improved by simple methods; but as Kallitype so readily lends itself to after-treatment, it may be well to briefly outline a few of the ways in which the prints may be improved.

Spotting the Prints I have before me, as I write, the album of a postal photographic club containing thirty-five prints, and out of the lot there are only three or four that would not be noticeably improved by a few touches of the sable pencil and pigment. Nearly every print has many disagreeable and distracting flecks of white in the shadows, caused in many instances by specks of dust between negative and paper when printing; others have here and there in the shadows, patches of lighter tone caused by stray reflections from a stone or a stump, or some other object of no value to the general result, but, on the contrary, distracting the attention from the object of interest, causing a lack of unity and breadth. These imperfections could have been so readily removed by

careful spotting that it seems almost criminal to have neglected it when one considers the good quality of the work in other respects.

I know that the makers of some of these prints will cry "fake," and tell me that they are photographers; and to them I might suggest that if they will devote their attention to the making of pictures by whatever means, the lover of pictorial work will not quarrel with their methods, providing that their results are pleasing.

If, however, they are determined to be photographers, rather than makers of pictures by photography, they can pass the following suggestions.

A properly spotted print will show no traces of the work; and to assure this it will be necessary to exactly match the color and tone of the print. Matching the color will be found quite simple, all that is necessary being a cake of opaque, or other spotting medium, of which there are several to be had from the stock houses, and a small tube each of white, blue, red, and yellow water color. A sable pencil of the smallest size, and one a size or two larger will be needed, as well as a porcelain saucer with at least two compartments. In one of the compartments you will mix a little of the color to match the darker portions of the print; in the other, a lighter tone, to match the half-tones. You will also have at hand a cup of water. In matching the color I have found that in most cases the opaque, with a little of the white, will answer; but occasionally it will be necessary to use one or more of the colors before an exact match is secured. Having mixed the color, the spotting of the darker portions of the print should first be tried, as this will be found quite easy.

The brush is first filled with the color, and then wiped on the rim of the saucer to remove the surplus liquid, when it may be tried on the print. If the shadows are very deep in tone, no great care is needed; but in the lighter portions of the print one must make sure that the spotting is not darker than the print. Here it will be safer to start with a tint that is surely lighter, and make several applications if necessary. In spotting the more delicate tones, I have found it a good plan to touch the print lightly with the brush,

wiping at once with the finger-tip, and repeating until the exact tone is secured. If the spotting is found to be too dark, it may be at once removed by the finger-tip slightly moistened in the cup of water, and another trial be made. After a little experience, the worker will find it quite easy to remove all these little defects, as well as many larger ones, such as "shotholes" in foliage, or unpleasant reflections from the leaves of trees; and he will be able to tone down, and render inconspicuous, discordant lines that mar the composition of his print. If he will invest in a good supply of the excellent reproductions of paintings that may now be had at a low price, and religiously compare with these his own work having a similar composition, he will find frequent use for the brush, thereby adding to the pictorial quality of his photography. An examination of the masterpieces of our exhibitions shows that this practice is widely followed.

Modifying Results The prints, having been dried, will now be taken up for consideration as to their final fate. Those that are palpably too dark will be laid to one side, and those first considered that seem to be about right as far as depth of printing is considered. We may have a portrait with rather a cold tone which we would like warmer. This change may be readily effected by a uranium bath, as follows: Uranium nitrate, 5 grains; potassium ferricyanide, 5 grains; glacial acetic acid, 20 drops; distilled water, 2 ounces.

First make sure that the print is not "chalky" or weak in the half-tones, as this bath has a slight reducing action, not at all in accordance with what one would expect, after using it in the platinum process, as explained in THE PHOTO-MINIATURE No. 40.

A brief immersion will modify the tone, and long-continued action of the solution will give a decided red tone. The print should therefore be removed to a tray of water to which has been added a few minims of acetic acid, as soon as the desired tone is obtained. The print may then be given three or four quick changes of water, when it may be dried as usual.

Or we may have a snow scene that is **Brown-Black** altogether too brown for the subject.

This may be remedied by the following platinum toning bath. Potassium chloroplatinite, 1 grain; citric acid, about $\frac{1}{4}$ grain; water, 1 ounce.

The exact proportion of citric acid is not important, it simply being necessary to have the solution slightly acid. The platinum is best handled by putting 15 grains in 15 ounces of distilled water, thus securing one grain of platinum to each ounce of solution. This bath has proven quite satisfactory with me, more so, in fact, than the more complicated formulæ given in many of our text-books.

A similar tone, though somewhat more **Blue-Black** of a bluish cast, will be obtained by almost any of the usual gold baths to be found in the various publications. On the whole, however, I prefer the acetate gold bath, as follows: Acetate of soda, 48 grains; water, 16 ounces.

Make up a gold solution of 15 grains to 15 ounces of distilled water, and add one ounce to the acetate solution when ready to begin toning. This bath keeps indefinitely, working better as it gets older if filtered through cotton after using. Each time it is used, however, fresh gold must be added, even though not more than a single print was toned at the last using.

There is also another unusually good
Combined gold bath given by Dr. Frederick:
Toning and Water, 8 ounces; hypo, 1 ounce; gold
Fixing chloride, 1 grain.

This is a combined toning and fixing bath, and those who prefer the tone given by it should substitute it for the fixing bath previously given. I am aware of the numerous objections to a combined-bath, but I know of several very successful workers who have used this bath exclusively for several years without discovering any lack of permanency in their prints up to this date. It may, therefore, be considered quite safe.

If one has a fancy for blue tones, he will make use of the following: Citrate of iron and ammonia, 5 grains; potassium ferricyanide, 5 grains; nitric acid, 10 drops; water, 4 ounces. This bath may be used at any time

after the prints have been fixed and washed, but if the prints have been dried they should be thoroughly moistened before proceeding with the toning. An immersion of a few seconds will be sufficient, when the prints should be washed in a few quick changes of water, or until the whites are clear, and then dried as usual.

Too long an immersion in the toning bath will result in degraded high-lights, and should therefore be avoided.

The worker who is experimentally inclined will do well to read carefully *THE PHOTO-MINIATURE NO. 40: Platinotype Modifications*, as he will find that similar modifications may be made in Kallotype by following the methods there described.

We will now take up the over-printed
Reducing proofs. If only slightly over-printed, they may be brought into shape by the uranium toning bath previously given, using half the quantity of water. But if badly over-printed the following should be tried: Hydrobromic acid, 35 minims; water, 1 ounce. The prints should be thoroughly dampened before reducing, and must be kept moving in the bath. The action of the reducer will be evident in a minute or two, and will proceed slowly and evenly until the print is of the proper strength, when it is removed, given several quick changes of water and dried.

If the solution does not begin to act in two minutes it should be poured into a graduate and a few drops of hydrobromic acid added; but I have found the proportion given to be just about right, and have seldom used a stronger solution. It will sometimes, however, act too quickly, which will be remedied by adding more water. This bath is also useful in correcting prints that are somewhat flat and lacking in "pluck," on account of too little restrainer in the developer, a short immersion being sufficient to clear up the high lights and make a bright and pleasing print out of a very flat one. When the print is sufficiently reduced, it is given a slight rinsing and placed in the hypo for five minutes, and then washed and dried.

This reducer has proved to be one of the most satisfactory things in connection with the Kallotype process, as it practically solves the problem of printing, and ren-

ders the loss of a print rare, except in the case of under-printing or serious error in the composition of the developer, both of which may be avoided by a reasonable amount of carefulness. One can certainly make sure that the proof is not under-printed if he knows that double the normal printing can be corrected; and as to the developer, a trial print will show him whether he is using the proper amount of restrainer.

We have now come to the finished **Varnishing** print, and if we have been working with a reasonably normal negative, the print as it now appears will justify our expectations, and probably exceed them. But, as I have remarked more than once previously, many of our negatives are not normal, and some of our prints will show a lack of depth in the shadows, and that absence of clearness which comes from a perfect range of tone. To remedy this, the platinum workers brighten up the shadows with megilp or *Lustralene*, which will also improve the Kallitype print. As a rule, however, I find that Seed's Positive Varnish will effect a greater improvement in the appearance of the print than anything else that I have tried, while it has the added advantage of protecting the film from the action of the air.

The surface of the print is lightly gone over with a tuft of cotton moistened with the varnish, and laid aside to dry. In a minute or two the varnish will have disappeared, leaving the surface as before, except that it will be a trifle brighter. The operation may be repeated several times, until the maximum brightness without gloss is attained, when we may feel that we have a finished Kallitype print.

Glossy Prints The amateur occasionally finds that some appreciative editor desires one of his prints for reproduction, and he accordingly fixes up a nice print on platinum or some other matt-surface paper and sends it along. And, if it happens to be his first experience, he will be just the least bit surprised by receiving a polite note requesting a glossy print for the purpose. He had received with much pleasure the intimation that his work would interest the public, and had exercised unusual care in

getting up a print that would represent him at his best, probably sending it carefully mounted, and it is now somewhat disconcerting to learn that he has been altogether on the wrong track. He will soon learn, however, that the photo-engraver and the editor have ideas of their own on the subject of prints for reproduction, and that one of them is a firm conviction that the print must be made on glossy paper if satisfactory reproduction is to be assured. On this basis, the glossy print must be made, although he may have discontinued the use of glossy paper so long ago that he has forgotten how to go at it. Thinking it over on these lines, it occurred to me that a glossy Kallitype print could be made without much difficulty, and I give you the results of my experiments.

A sheet of glass somewhat larger than the print is cleaned with French chalk, polished with a soft cloth, given a coating of negative collodion, and set up to dry where it will be protected from dust. The following solutions are then made: No. 1—Gelatine, $\frac{1}{4}$ ounce; water, 5 ounces. No. 2—Gelatine, 80 grains; water, 8 ounces. In my experiments I used Nelson's No. 1 gelatine, which is very soft and sets slowly. A more satisfactory result will be obtained by using Heinrich's, or one-half Heinrich's and one-half Nelson's. The gelatine is allowed to soak in cold water until it is thoroughly swelled, when it is dissolved by gentle heat.

The print is saturated with water and laid on a clean glass plate face up, and the surplus moisture removed with a blotter and a squeegee roller. The plate is then carefully leveled and No. 1 solution poured upon the center of the print and spread over the entire surface with a glass rod. As soon as the gelatine has set it is ready for the final operation. Solution No. 2 is now warmed and poured into a tray of convenient size, into which the collodionized plate and the prepared print are carefully slipped to avoid bubbles, and brought into contact, the face of the print of course being next the collodion. The print is then lightly squeegeed into optical contact with the glass and dried.

When thoroughly dry, one corner of the print is raised with the point of the knife, when it will strip from the

glass, bringing the collodion film with it, and you will have a print glossy enough to suit the most exacting photo-engraver.

We have now finished our brief survey of the Kallitype process, and, with the suggestions given, the reader will find no difficulty in making at least as satisfactory prints as with the regular photographic papers, and in many instances, much finer ones. It may also interest him to know that the cost will be much less, being only about 8 cents (4 pence) per dozen for 5 x 7 prints. The low cost will encourage him to make whatever number of trials may be necessary to obtain the best possible rendering of his negative; and after that, if he is a stickler for carbon or platinum, he can make his final print on either of these mediums.

And, right here, it may be well to refer to the question of permanency. I can already see a smile on the faces of many amateurs, especially on the faces of those who have either not tried it at all, or who have just had a "dab" at it, as I have many times heard the cry "not permanent." Now, I am just a trifle inclined toward laziness, and don't at all relish the idea of putting in my time on anything that may have only a transient, and one might say, an evanescent value; and I therefore looked into the question of permanency pretty carefully before taking up the process. I had already seen prints in platinum, carbon, Solio, Aristo and Velox, which, although only a year or two old, were far from their first estate. I knew, of course, that if these papers had been properly handled they should have been in perfect condition at the end of two years, and, at the same time, I had heard of Kallitype prints four or five years old that were absolutely as when first made, and I therefore concluded that with Kallitype, as with other photographic processes, permanency depended largely upon thoroughness in the various operations. My very first results were not permanent; but, as soon as I learned to thoroughly coat, thoroughly develop, thoroughly clear, thoroughly wash, thoroughly fix, and thoroughly and finally wash, as previously explained, my prints held their own, and some of them were simply tipped to a mount by the corners and pinned

on the wall of my sitting-room two years ago. It is, therefore, quite evident that Kallitype is as permanent as the Solio or Velox class of papers, and, as it has other advantages which these do not possess, it is well worthy the attention of the progressive amateur.

HENRY HALL.

Single
Solution
Kallitype

Since Mr. Hall prepared the fore-going for press, my attention has been called to a very simple Kallitype method which may appeal to some readers.

This method was described by Mr. George E. Brown in the *Amateur Photographer* (1901), and is said to give prints of a warm brown color. I quote:

We first make four stock solutions—*A.* Green ferric ammonium citrate, 110 grains; water, 1 ounce. *B.* Tartaric acid, 18 grains; water, 1 ounce. *C.* Silver nitrate, 45 grains; water, 1 ounce. *D.* Gelatine, 30 grains; water, 1 ounce.

The gelatine is allowed to swell for half an hour in a portion of the water, and then dissolved in the remainder by the aid of heat—i. e., the bottle containing the two is placed in a saucepan of water, which is brought nearly to boiling.

A few words as regards the chemicals used above. Green ferric ammonium citrate is an improved form of the familiar purplish red citrate of iron and ammonia obtainable at all the drug-stores. The green citrate is obtainable only through the various branches of the firm of E. Merck. It gives a much more sensitive paper than the ordinary citrate. Distilled water should be used for all four solutions. The tartaric acid solution does not keep indefinitely, developing in time a fungoid growth; a little carbolic will prevent this, but the solution is so readily made that it is best to make fresh when wanted. The gelatine solution keeps only a few days.

To make the sensitizing solution we mix equal parts of these four solutions, say 1 dram of each.

First get the gelatine solution quite fluid, measure out, and pour into a shallow cup, which is then placed in a vessel of warm water. Next add the iron and

tartaric acid solution, and lastly, a few drops at a time—keeping the mixture in the cup moving—the silver nitrate.

We now want, for coating, a soft board, a tuft of cotton wool, and a dry camel's hair brush.

The paper to be coated may be of very good quality, such as little cartridge paper or drawing paper, or the brands specially supplied for ferro-prussiate printing. It is pinned down to the board with four drawing pins.

Now soak the cotton wool in the lukewarm sensitizing solution, and mop on to the paper, equalizing as far as possible with the cotton wool itself. Now complete coating with the camel's hair brush, brushing very lightly first one way of the paper and then the other, until the coating just loses its wet, shiny appearance, and begins to look matt. Too much or too vigorous brushing leaves streaks on the paper.

The paper is then set to dry, which it will do a few feet from a fire, or in a warm room, in a few minutes. It can be printed at once, or it will keep a few days preserved from damp.

The negative is printed until a fairly vigorous image is obtained, in which the details in the high-lights of the original begin to be apparent. The print is developed by placing in plain water for about two minutes, in which it takes on a reddish brown color. It is then transferred to a solution of thiosulphate of soda (hypo.) for a minute or two—hypo., 10 grains; water, 1 ounce.

Here the print becomes brown in color, and loses slightly in density. If allowed to remain too long, or if too strong a hypo. solution is made, the loss in density becomes appreciable. Washing for an hour or so completes the process.

The process does not give prints with the long range of gradation which characterizes platinum or gelatinochloride papers, but for the many purposes in which a broad effect is wanted, or where a number of prints are required quickly and cheaply (as for registering copyright, making negative files, etc.), the method deserves more attention than it has hitherto received.

BOOKS

Chapters on the various printing processes based on the light-sensitiveness of the iron salts can be found in most general text-books on photography, Abney's *Treatise on Photography* being especially satisfactory from this viewpoint.

Platinotype, by Abney and Clarke, mentioned by Mr. Hall as helpful, is the authoritative work in English dealing with platinum papers. Particular attention is devoted to the preparation and properties of ferric salts, sizes and paper stock useful in the Kallitype as well as platinum processes.

Ferric and Heliographic Processes, by George E. Brown, contains an interesting chapter on Kallitype Methods with working formulæ for the production of different colors (tones), etc.

The Blue Print and its Variations (THE PHOTO-MINIATURE No. 10); and *Platinotype Modifications* (THE PHOTO-MINIATURE NO. 40) should also be consulted by the reader who seeks further information regarding the iron printing processes.

Notes

A new objective, named the Tessar, is announced by the Carl Zeiss Optical Works, of Jena [American agent: E. B. Meyrowitz, New York]. It is a rapid lens, designed for figure-work, portraits, landscapes, reproduction and hand-camera work, and is especially noteworthy for precision in definition and the brilliancy of its images.

The announcement describes the Tessar as belonging to a new type of objectives calculated by Dr. Paul Rudolph. The system consists of four thin lenses, mounted in pairs and separated by a central diaphragm. The back element comprises two cemented lenses; in the front element the lenses are separated by an air-space. By this construction great intensity (rapidity) is secured, together with extremely fine definition over a large field, with wide angular capacity. The glass employed is very transparent and durable (i. e., not subject to atmospheric conditions), and possesses the power of lessening the troublesome secondary color spectrum. The Tessar is, at present, obtainable in two distinct series. Series II b, with the relative aperture $F/1:6.3$, is made in twelve sizes. This series, in seven sizes of short focal lengths, can also be had mounted in a special focusing-jacket, for use in hand-cameras of the "fixed focus" variety. The Apochromat-Tessar, Series VIII, with the relative aperture $F/1:10$ to $F/1:15$, is obtainable in five sizes, and is intended for reproduction and color work. The lenses of Series II b have the same rapidity as the Zeiss Protar, Series VII a and the Unar $F/1:6.3$, but for some uses deserves preference to either of these. The Protar stands alone in its double usefulness as an extremely rapid objective with extreme defining power and as a convertible lens, i. e., combining objectives

of two or three different focal lengths. It has, however, eight glasses, and is thus more expensive than the Tessar, which, by the simplicity of its construction, is produced at a lower cost. Like the *Unar*, the *Tessar* is not convertible, but it is preferable because of its uniformly sharp definition over the whole area of the plate. In this feature the *Tessar* is remarkable.

The Apochromat is similarly noteworthy for its critical definition, and is corrected for color in a degree which renders it especially desirable for tricolor reproduction work. It is fitted with a rotary diaphragm.

In price the *Tessar Series IIb* comes between the *Protar* and the *Unar* series, which, with its peculiar characteristics, will undoubtedly give it a wide popularity.

The February number of *Das Atelier* presents a three-color print of a landscape with figures, photographed direct from nature by Dr. A. Miethe. The print shows the advance made by Dr. Miethe since the publication of his famous "Lady with the Red Parasol" a year ago. It is very effective in its coloring, the flesh-tints, costume and greens of the landscape being faithfully rendered.

The latest addition to the photographic market is the Ansco Transparent Cartridge Film, manufactured under the much-litigated patent of the late Rev. Dr. Goodwin, and introduced by the Anthony & Scovill Co. of New York. Ansco films are obtainable in twelve sizes for use in the well-known Ansco and other roll-film cameras.

Photographic classes, designed for beginners, are being formed at the Mechanics Institute, Rochester, N. Y. The fee for tuition is nominal and the classes are held in the afternoon and evening under the instruction of J. E. Woodland. This departure is one which might be followed with advantage by every Mechanics Institute and Trade School from Atlantic to Pacific. It is

remarkable to note how few such institutions include a photographic course in their programs.



According to a note in the Brooklyn (N. Y.) *Eagle*, the first woman to learn photography as a business was Miss Mary Ann Meade, a sister of the well-known Meade Brothers, who achieved high reputation as Daguerreotypists, in New York, during the forties and fifties. Miss Meade, who died a few days ago in Brooklyn, was born in London in 1826. On the announcement of Daguerre's process in 1839 her brothers journeyed to Paris and were instructed in the Daguerrean art by Daguerre himself. During their stay they made the celebrated Meade portrait of Daguerre which is now preserved in the National Museum or Smithsonian Institute at Washington, D. C. In the early forties the Meade family emigrated to the United States and located at Albany, N. Y. The brothers Meade shortly afterward opened a studio at 233 Broadway, New York, and here Miss Meade worked with them during the years in which Meade Brothers made their gallery famous.

Among the many prominent people whom Miss Meade met during her photographic career were Charles Dickens, Lester Wallack, Edwin Booth and Jenny Lind. After her brothers died Miss Meade retired from the business and resided in Brooklyn until her death.



It is rumored that the Eastman Kodak Company will, at an early date, introduce a new roll-film called the Pelloid Film. According to report, the Pelloid Film will be 25 per cent more rapid than the present Kodak film, will be more sensitive to red and yellow (i. e., will have orthochromatic qualities), and will possess even greater latitude in exposure than the present film.

This introduction probably results from the success of the Pelloid Plates introduced in Britain by Kodak Ltd. some two or three months ago. Pelloid plates

are really cut films, thin, flat and unbreakable, attached to card supports at the edges with metal clips, for use in ordinary plate cameras and handled exactly as glass plates are manipulated.

Since the foregoing note was written the name of the Pelloid cut film has been changed to Kodoid Plates. We are not informed whether this change applies also to the projected roll film mentioned in the earlier paragraph.



We hear with pleasure that the third Chicago Photographic Salon, which closed January 4, met with great success and appreciation. The exhibits comprised 191 prints, sent from many states and Canada, and averaging high in pictorial and technical quality. At the close of the Salon most of the exhibits were sent on to Minneapolis for the Salon now open in that city. An effort is making in Chicago to raise an endowment fund for a permanent Salon organization, which effort will, we hope, meet with the encouragement it so well deserves.



The appearance of the new Ansco roll-films has brought forward notices of suits and countersuits concerning alleged infringements of certain patents involved in the manufacture and marketing of roll-films. We have been asked to publish information on "the situation" as a matter of public interest, but THE PHOTO-MINIATURE is utterly opposed to the discussion of trade controversies in its pages. Those interested in the legal battle of roll-films can obtain full and accurate information from the parties chiefly concerned, to wit: The Eastman Kodak Company of Rochester, N. Y., and The Anthony & Scovill Co., New York City.

On the other hand, legal decisions affecting the sale or use of photographic specialties may properly find place here as directly interesting our readers. Thus we note in the Rochester (N. Y.) *Democrat and Chronicle*, that the English courts have decided the long-winded dispute *in re* Trade Marks, between Kodak Ltd. and

several British manufacturers and dealers, in favor of Kodak Ltd. According to this decision the word "Kodak" applies to the film as well as the camera, and manufacturers of roll-films, other than Kodak Ltd. will not be permitted to use the word "Kodak," "Brownie" and "Bull's Eye" on the packages of their films and other photographic specialties. As a consequence of this decision our British readers and Americans traveling in Great Britain can, by ordering supplies of roll-films under these trade marks, assure themselves of obtaining films made by Kodak Ltd.



By inadvertence, we omitted to mention in our last issue the very interesting exhibition of photographs, by Mr. Alvin Langdon Coburn, given at the Camera Club, New York, January 12 to 30. This exhibition comprised fifty-six examples of Mr. Coburn's work in portraiture, landscape and pictures of the California Missions, as shown in the illustrations of our January issue. Mr. Coburn is one of the most promising of the younger workers in American pictorial photography, and has studied under Mrs. Käsebier and Mr. F. Holland Day. The exhibition was interesting, as revealing the promise of great things from Mr. Coburn when he reaches the maturity of his capabilities. His pictures of the California Missions, more particularly, call for warm praise and commendation, as displaying a delicate appreciation of the spirit of place and pictorial effect.



Under the editorship of Mr. Charles E. Bolwell, *The Photo Budget*, published by Charles H. Loeber, 15 East 17th street, New York, shows a decided growth in interest and value. An attractive feature is the "Clean-up Sale" department, wherein many irresistible bargains are listed month by month.



Among many interesting papers recently published in *The Camera*, the symposium on "Focusing" by Leon

Vidal, the editors and others deserve special mention. Focusing is a neglected detail in these hand-camera days, but its vital importance is appreciated by those who strive after good technique in their work. The editors of *The Camera*, therefore, deserve the thanks of all progressives for bringing the subject up for discussion. Amateurs who do not see *The Camera* regularly miss many helpful lessons and pointers. [F. V. Chambers, 120 South 7th street, Philadelphia.]



Mr. François Voitier, the well-known writer on photographic topics, has turned his surplus energies into the special field of commercial photography, with work-rooms at 64 Vesey street, New York. As a photographer Mr. Voitier delights in difficult propositions, and readers hesitating about a ticklish bit of enlarging or copying can advantageously turn the work over to him.



Microgen seems to be growing in favor as a developer. Our correspondence during the last few months has contained many references to it, almost invariably accompanied by praise for its efficiency, flexibility and similar good qualities. Formulæ and a special circular covering its use may be obtained for the asking from the manufacturers, Burke & James, Chicago and New York.



An important paper on "The Saving of Platinum Wastes," by A. J. Jarman, appeared in *Wilson's Photographic Magazine* for January. This should not be overlooked by those who use large quantities of platinum paper. Mr. Jarman is an experienced worker in platinum, and the method he describes is as practical as it is simple. [Edward L. Wilson, 287 Fourth Ave., New York. 30 cents.]



During the winter months many amateurs using print-out papers are discouraged by the length of time

consumed in obtaining prints. An unusually full description of a method for developing faintly printed prints on gelatino-chloride papers, by J. T. Hackett, may be found in *The British Journal Almanac* for 1903, recently published. The article gives formulæ and working details in abundance, and is, in itself, worth many times the price of the Almanac. This annual, by the way, has latterly been "sold out" within a few weeks after publication, hence those who want it should avoid procrastination lest a greater evil befall them.



The officers of the Photographers' Association of America met in executive session at Indianapolis, January 12. At this meeting the resignation of H. A. Collings, first vice-president, was accepted, and C. R. Reeves, of Anderson, Ind., appointed in his place. The financial reports of the secretary and treasurer showed a balance in the treasury of the Association for 1903 amounting to \$5,175.89. With this in hand, there is certainly ample scope for the most remarkable national convention in the history of the Association; and we hope the officers of the P. A. of A. will avail themselves of the opportunity.

The convention will be held at Das Deutcher Haus, Indianapolis, August 4-7 inclusive, under the leadership of President J. George Nussbaumer, of Buffalo. Information concerning exhibits, etc., can be obtained on application to the secretary, G. G. Holloway, Terre Haute, Ind.



It has been decided to hold the third San Francisco Photographic Salon in October, and arrangements are already in progress for securing a successful exhibition. The affair is in the hands of an able committee, headed by Mr. A. L. Coombs, an active member of the California Camera Club, who may be addressed at 819 Market St., San Francisco.

In order to encourage liberal contributions from pictorial photographers at home and abroad, and to save the expense of framing pictures that may not be ac-

cepted, as well as the greater expense of transportation, pictures suitably mounted or matted will be received from contributors in the United States, and such as are accepted by the Jury of Selection will be glazed by the Salon Executive Committee at the exhibitor's expense.

Foreign contributors may send their pictures either unmounted, mounted or matted as they desire, and the management will mount and glaze those accepted, and return the entire contribution to the owner after the exhibition free of charge.

With the above-mentioned exceptions, the general rules which governed the Second San Francisco Photographic Salon will prevail, the details of which will be set forth in the regular announcement shortly to be issued.



Doubtless our readers noticed from the back cover of our January issue that the famous Aristo Eagle has broken the boundaries by its vigorous growth. The design is emblematical of the growth in favor and prosperity of the American Aristotype Company, whose products are now more widely used than any others of their class. A careful reading of the "Aristo Manual," obtainable free for the asking, will show how carefully and thoroughly this company takes care of those who appreciate and use its specialties.



The ingenuity of the various exposure meters now in the market is wonderful. In the Cheape Exposure Meter, for example, a simple automatic movement, setting the scale, gives the exposure required for any plate or film under any conditions. Since its recent improvements we have used the Cheape Meter with considerable satisfaction, and can recommend it as exceedingly helpful to the beginner in photography. [Cheape Exposure Meter Company, Charlottesville, West Virginia.]

Tennant and Ward's List OF NEW BOOKS AND PUBLICATIONS

PHOTOGRAMS OF THE YEAR 1902. A Pictorial and Literary Record of the Artistic Photographic Work of the Year. Compiled by the Editors of *The Photogram*. (8th volume of the series.) The only annual record of its kind. 200 pp.; 200 illustrations. Paper, \$1. Library edition, \$1.25, postfree. Send for detailed prospectus.

AMERICAN PICTORIAL PHOTOGRAPHY. Representative examples of the work of the American School of Pictorial Photography. Selected by and reproduced in photogravure under the personal supervision of ALFRED STIEGLITZ, and formerly published by "Camera Notes." Series I, *net*, \$15. Series II, *net*, \$8. The edition was limited to 150 copies of each series, and only a few sets are obtainable. Descriptive circular on request.

**THE "CAMERA NOTES" IMPROVED GLYCE-
RINE PROCESS** for the development of platinum prints, including the experiments of ALFRED STIEGLITZ and JOSEPH T. KEILEY. Illustrated with facsimile reproductions in color, by the experimenters. Reprinted from "Camera Notes." Only a few copies obtainable. Paper covers, *net*, \$1.

AN INDEX OF STANDARD PHOTOGRAMS. Being a guide for Authors, Editors and Publishers of Illustrated Books and Periodicals, Collectors of Pictures, etc., listing photographs available for publication purposes. Sold by subscription only. Particulars on request.

PHOTOGRAPHY FOR NATURALISTS. By DOUGLAS ENGLISH. A book for those interested in photographing animals, etc. 132 pp., fully illustrated. \$2.50.

PRACTICAL NOTES ON TELEPHOTOGRAPHY. By BECK LTD. A pocket-book of practical information. Cloth, 25 cents.

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Rochester, N.Y Jan. 16

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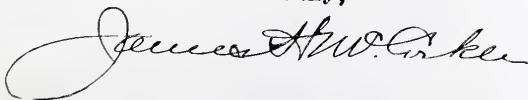
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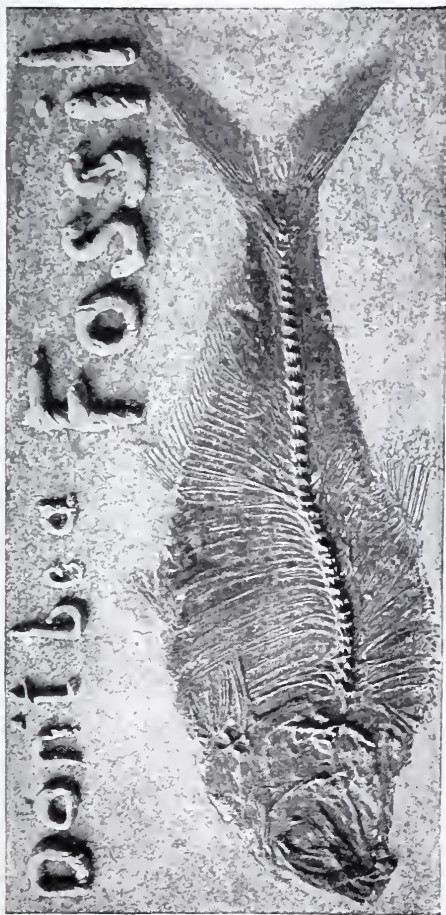
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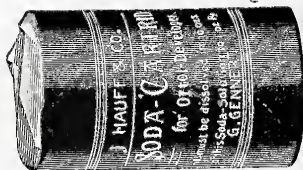
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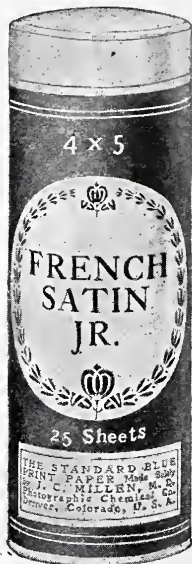
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ILLUSIONS DISPELLED

THE KODAK DEVELOPING MACHINE SCIENTIFICALLY CORRECT IN PRINCIPLE

The photographic world is waking up to the advantages of timed development. In England, where there is more of a tendency to scientific discussions on photography than in this country, this subject is attracting a great deal of attention. Mr. Alfred Watkins, in a paper read before the Society of Arts, has said some very pertinent things anent time development:

Let me also consider the procedure which the maker's instructions and the text-books have advocated for dealing with over- and under-exposure with pyro soda developers, when unknown beforehand.

It is usually advised that when the lower tones appear so slowly that under-exposure is feared, the developer should be diluted and more alkali added "to bring out detail." On the other hand, if all the tones come out in such rapid succession that over-exposure is revealed, the traditional advice is to at once add more pyro—say, two grains to the ounce—and an equal quantity of bromide, or else mix up and apply a new developer exceedingly strong in pyro and bromide. It is certain that such a developer has a great power of holding back the lower tones and altering gradation *when it is used from the commencement*. But I have never been able to discover that any such selective power exists when once these lower tones have appeared, or that the methods I indicate above, and which are usually termed tentative development, confer any power which cannot be equally well exercised by using a standard developer from the commencement.

It was Hurter and Driffield who proved that under- and over-exposures ought to receive the same time of development to secure the same contrast. The over-exposed negative utilizes the upper tones of the series, and is denser throughout. The under-exposed negative utilizes the lower tones of the series, and is thin throughout; but, except where they fringe on the extreme tones which are under or over the range of the plate, both negatives give prints of much the same detail and steepness of gradation. In this time development, therefore, the exposure decides the density of the negative.

When I have had rollable films to develop, I have also followed the same plan of timing, developing the whole roll at once.

In fact, it is with rollable films that the method of developing different exposures for the same time has come into general use. Probably nine-tenths of the rollable films developed in the last year or two have been developed without cutting up the roll at all, perhaps in most cases on account of ease and simplicity, without knowledge that it was the theoretically correct proceeding. I mention this because I notice that several photographers, in speaking of the results attained by roll-film developing machines, seem to think it is a new thing to attain uniformity of results by developing the whole roll at once.

The bromide influence is very limited, not well in control, and cannot be exercised after all the tones have appeared. Bromide is best omitted from the developer, being unnecessary. The influence of time is quite sufficient for all control required.

In the quotation above we give only what Mr. Watkins said regarding time development, omitting his comparison of various reducing agents. As far as it goes what he says coincides precisely with our own experience, but in considering the time method of development in connection with the Kodak Developing Machine, one should bear in mind that the entire absence from fog (occasioned by the fact that development proceeds in absolute darkness) gives negatives of far greater brilliancy than those made by the ordinary methods.

The fact is bound to soon be recognized that the Kodak Developing Machine is not only a convenience, but that it gives better results than can be obtained by any other method.

We have published testimonials regarding the Kodak Developing Ma-

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chine from many leading American amateurs. We could fill these pages with hundreds more from enthusiasts of lesser note, but for this month will let one suffice. This one, however, is from a man so well known throughout the photographic world as to carry convincing weight:

Glasgow, Nov. 14, 1902.

Time was when there was some merit in developing a negative well, but "*vous avez changé tout cela.*" I have made my first trial with your daylight developing apparatus, and *find it a complete success.* The various operations are exceedingly simple, and the resulting negatives are quite equal to what would have been obtained by developing the exposures separately in a dark-room. This was somewhat surprising, as some of the exposures were winter landscape snap-shots, and others were rather over-exposed portraits.

J. CRAIG ANNAN.

THE KODAK DEVELOPING MACHINE

Photo-Beacon, November, 1902.

At the National Convention I had the pleasure of seeing for the first time the Kodak Developing Machine in operation, and was so thoroughly convinced of its practicability that I placed an order for the large size at once. It was not, however, until the beginning of October that the style "E" machine got on the market, and, therefore, I was unable to make any trials with it until that date. At the close of the National Convention I spent a few days at the Falls of Niagara, making a number of exposures with a Stereo Film Camera. I kept my rolls of film for machine development, and in the meanwhile I made some interior views of the house of one of my friends; so that I was ready for a serious amount of work when the instrument came to hand.

Before beginning operations I carefully read through the instruction-book that accompanies the machine; then I got everything in shape, and, beginning with page one of the instruction-book, I followed every detail exactly as set down. On taking the first film from the machine I was delighted with the results, and went right ahead until all my rolls were finished. After they were dry I examined them very carefully by daylight, and can only express entire satisfaction with the results.

I think I was the first editor in the whole world who at the very start approved of the Watkins system of development, and every one of my instruction-books recommends that system. It was a rather risky thing to recommend

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this system in the days of its infancy, because, when Mr. Watkins first brought it into public interest he was derided by the leading scientific photographers of the world, and practically every photographic journal sneered at his ideas; but in my own way, though very crudely, I had evolved a similar system in practical work, having learned by experience that with the pyro formula I was in the habit of using at that time, it took just four minutes and twenty seconds to develop a plate, and, after developing over 5,000 plates by this rule of thumb system, I knew Mr. Watkins had discovered the theory that governed my practice. I think I was also the first to publish a method of developing film in the roll by the see-saw motion in a fairly large developing bath, and have developed many hundreds of rolls by this method. The only drawback to the system is that one is very apt, at the beginning, to get uneven flowing of the solution, with consequent stains. The possibility of these is obviated in the Kodak Developing Machine, and for that reason alone I desired to use this new device, even although it might not have any other advantages.

After what I have said, my readers can understand that I heartily indorse every word that has been said in favor of this new tool, and recommend it strongly to my readers.

F. DUNDAS TODD.

PHOTOGRAPHIC COMPETITIONS

For the benefit of those interested, we will give here, each month, a bulletin of the important photographic contests in progress throughout the United States.

BAUSCH AND LOMB OPTICAL COMPANY, Rochester, N. Y. International competition. \$3,000 in prizes. Closes October, 1903.

C. P. GOERZ OPTICAL WORKS, 52 Union Square, E., New York. Cup competition for professionals. Closes August 1, 1903.

LESLIE'S WEEKLY, 110 Fifth Avenue, New York. Weekly competitions open to amateurs. Prizes, \$10, \$5, \$1.

BUFFALO EXPRESS, Buffalo, N. Y. Continuous contest. Prizes, \$5 to \$25 weekly.

WORLD WIDE

RAPID GROWTH OF THE KODAK CORRESPONDENCE SCHOOL OF
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The Kodak Correspondence School of Photography now has pupils not only from every state and territory of the Union, but also from Alaska, Hawaii, Porto Rico, Canada, Mexico, Cuba, British Columbia, Jamaica, Europe and the far-off Philippines. As a practical common-sense help to the amateur photographer it has no equal. The text-books are simple, concise and up-to-date. The criticisms are given by practical men, who themselves know how to make good pictures and who know how to tell other people about it. The tuition is practically free, the nominal charge of one dollar

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Eastman Kodak Company

ROCHESTER, N. Y.

being made to cover the cost of text-books and postage. The school is open to all owners of Kodak and Brownie Cameras, and to no others. Here are a few comments from pupils:

Full of Information

New York, Nov. 4, 1902.

I am pleased to say concerning Kodak Correspondence School of Photography that it has been of much benefit to me. I think there is no feature of the school that is not worth much more than the cost of scholarship.

To have a competent person criticize one's negatives and prints and work generally is necessary to success.

The several text-books are full of useful information, and the book "Picture-Taking and Picture-Making" is the best all-round book for the beginner in photography that I have read.

I do not think the beginner or amateur who uses a camera and who wishes to do the best work he is capable of should hesitate a moment in joining the school.

Yours truly, A. R. Cahoon, 16 Exchange Place.

Cannot Praise Too Highly

Colwyn, Pa., Nov. 1, 1902.

I cannot praise too highly the work of the Kodak Correspondence School of Photography.

Before joining, I knew practically nothing of the art of photography, but your kindly criticism of my work sent you and your friendly advice have done much towards making me an amateur photographer.

Without your help, I doubt if I ever could have mastered the art, which before joining the school was interesting, but is now doubly so.

With kind regards, I remain,

Yours truly, W. H. Cubberley.

Made Rapid Progress

New York, Nov. 3, 1902.

I am very much pleased with the instructions received by the Kodak Correspondence School of Photography. Being a possessor of a "Kodak" since only three months, I must say I have made rapid progress with your kind assistance, to take and to make correct pictures, both from a technical and artistic standpoint.

All amateur photographers admitted to the school will greatly appreciate your efforts.

I remain, gentlemen, Yours truly,

Gertrude Lehmann, 442 E. 87th St., New York City

A Valuable Aid

Nov. 3, 1902.

Before becoming a student in the Kodak Correspondence School of Photography I had practically no knowledge of the camera and its possibilities. Your text-book, booklets, and most of all, the criticism of work submitted by me, have resulted in a feeling that a picture taken was a picture made.

The course is certainly a very valuable aid to the amateur photographer, and, as such, appeal to him from the moment he reads the first booklet.

Yours truly,

F. J. Weigand, Fishkill-on-Hudson, N. Y.

Improvement Has Been Marked

Rochester, Pa., Oct. 31, 1902.

I certainly do feel that your booklets and method of criticism have been a great benefit to me. It has helped me in my developing, printing and taking of pictures. My improvement has been marked since I have been taking your course of photography, and would recommend it to all who try to make progress in the study.

Yours truly, Stanley R. DePue.

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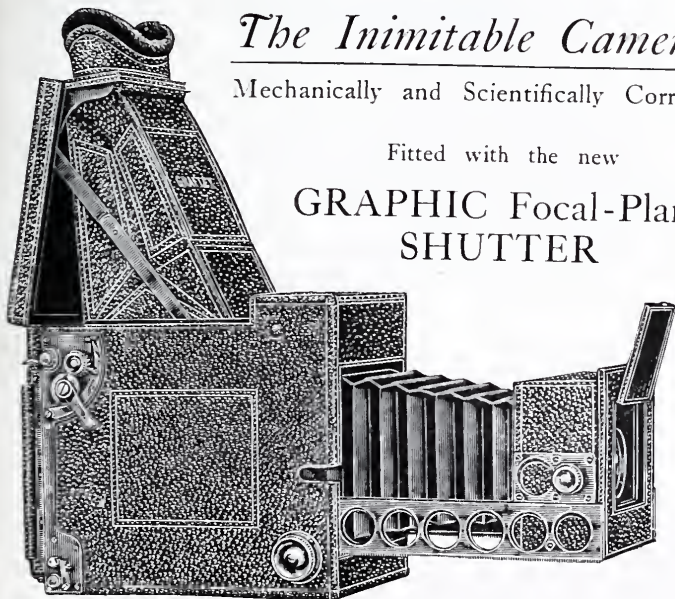
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You cannot get a substitute with the qualities possessed by the Seed Plate

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Simply to reproduce form accurately—to get a “likeness” of a person or object. In portraiture, for example, you seek to reproduce natural forms in their most pleasing aspect. One of the essential points in portraiture is expression. If you get that you get the “likeness,” the living portrait. How can you render expression unless you can accurately reproduce form? Expression is the result of subtle changes in the natural form of the features.

With the Seed Plate you can retain all the gradations of light and shade, from the highest point of light to the deepest shade without clogging, thus securing perfect form and expression—these necessarily going together.

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Seed's Chemical Pure Sulphite of Soda and Chemical Pure Carbonate of Soda
the purest and strongest sodas obtainable

and many other products

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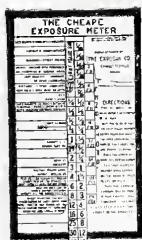
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Volume IV

MARCH, 1903

Number 48

COMMERCIAL PHOTOGRAPHY

If the old saying be true, that it takes nine tailors to make a man, then is it equally true that nine photographers of the ordinary sort are needed for the making of a commercial photographer. Perhaps I am mistaken, both in figures and fact, for any one of the few commercial photographers I have known was equal to, say, ninety-nine of the other kind, and your true commercial photographer is born, not made. Years ago, in the halcyon days of youth, it was my fortune to serve time at this craft, before I was permitted to enter the portrait studio,—so that I speak whereof I know. The mere memories of those days will suffice to give the reader a glimpse of the scope of commercial photography as a field of work. They will also serve to name some of the things which might be set forth here, if we could stretch this little book to the unwieldy bulk of a "British Journal Almanac."

I can recall the photographing of grimy machine-shops, churches, domestic interiors and grim old castles; a few old-world gardens, a stretch of railroad showing a new system of block signaling; speed trial of engines; the details of girder bridge and locomotive construction; rough freight cars and decorated passenger coaches; wayside railroad stations; old wills and doubtful signatures; ancient missals; historic paintings and tapestries; heating apparatus and furniture samples; choice bits from famous potteries; series of local views; scenes from plays for advertising purposes; buildings under construction and the surveys required for a waterworks plant; prize dogs; horses

and cattle ; stuffed birds and mineralogical specimens ; tombstones *in situ* and mortuary chapels ; stained glass windows and altar-pieces ; " storied urn and animated bust ; " a prelate of the church, deep in that sleep which knows no awakening ; a dear old lady who had incon- tinently hurried away to the better land without being photographed " for the family ; " and a brace of sheep- ish rascals destined to adorn the Rogues' Gallery. The list could be extended, for the memories come thick and fast ; but we have enough to prove that the commercial photographer is the free lance of his profession, who must possess a generous measure of capabilities for his abundant difficulties, a master craftsman whose work generally begins where his fellows are content to make an end.

There may be grumbling at this glorification of a theme which is seldom discussed. But compare, for a moment, the work of the portraitist with that of the commercial photographer. In portraiture the working conditions are fairly constant ; the light of the studio changes slowly as the seasons come and go ; the lens is seldom, if ever, changed ; the same brand of plates and working formulæ are adhered to year in and year out. The active man rebels against the deadly monotony of studio routine, one day being like another. His individ- uality finds expression only in the variation of his sub- jects, and even these are unconsciously classified. With the commercial photographer, on the other hand, the working factors change continually, and there must be a continual flow of new ideas to control new requirements. Go round the clock with him and see for yourself. In the early morning, when the light is quiet, he copies an old Daguerreotype ; when the sun is higher he makes negatives outdoors in sunlight ; noon finds him busy with a piece of machinery in a dimly lighted factory ; the afternoon is occupied with a delicately decorated set of china or an oil painting ; and at night there is a flashlight of the Masonic ball to be made for a morning newspaper.

Consider the difficulties involved by this very variety. In plates the commercial photographer must be familiar with and use slow and rapid ordinary brands, non-hala-

tion process, lantern and color-sensitive varieties. His lenses must be changed to meet the necessities of his subjects, from the wide-angle embracing a city block from across the street to the telephoto attachment for distant architectural detail. All these and innumerable other details of manipulation, from color screens to storage batteries for flashlight work, must be correctly diagnosed and provided for as quickly as they come to the front. Let any one who doubts the reality of the commercial photographer's difficulties try the simple experiment of photographing a plain white cup and saucer, or a sprig of mountain laurel in bloom, or a bed of yellow and red tulips in flower, so that the print shall exhibit the form, texture, modeling and "feeling" of the original. The experiment will clearly demonstrate the fact that what Mark Twain calls "the cussedness of things inanimate" often far exceeds that same quality as exhibited in the average subject for portraiture.

In the following pages we are to make brief excursion along these little-known but wonderfully interesting by-ways of commercial photography. We may never have to do the things discussed, but we will surely glean much information of direct advantage in our own hobbies. The writer of the monograph, Mr. Edward J. Davison, is himself a commercial photographer of proved ability and experience. He describes his methods with that brevity and directness peculiar to the practical worker. His contribution, the first attempt to make a book on commercial photography, is, to my mind, a distinctly valuable addition to THE PHOTO-MINIATURE series.—EDITOR.

**Prime
Essentials**

Sometimes I think that a knowledge of photographic manipulation is of secondary importance in commercial photography. Certain it is that the prime essentials to success in this line are: to be thoroughly awake, on the alert for every possible advantage, and to make ready use of one's wits. Without these things the expert in photography will fail in commercial work. I have proved this in a hundred ways. Among my help-

ers I have had many capable photographers, but the man who combines photographic ability with a wide knowledge of industrial conditions and a big share of common sense is indeed rare. There are so many "tight places" where a mere knowledge of photography is insufficient. The commercial photographer who can simply follow instructions under favorable conditions is not worth counting. Such a man will go to photograph a group of dogs at a country house and miss a set of horticultural pictures right under his nose, which would have brought more business than the dogs, simply because he "had no instructions," or he "carried only plates sufficient for his orders in hand." The successful commercial photographer has an eye open for every opportunity, makes his opportunities almost as often as they simply happen, enjoys his work and takes peculiar delight in the unexpected. In truth, I know of no other field in photography which offers so many chances for ability and enterprise, or which is so interesting or so profitable. But the man who dares will be sorely tried and must not fail. To hesitate is to play a losing game. The knack of doing things right at first attempt inspires confidence and proves the master hand and the fixed purpose.

Time is often of vital importance, and **Forethought** here there is no room for bungling or repetition. In large manufacturing plants, where machinery has to be stopped while the work is done, the photographer must think rapidly. This usually means thinking the work out before it is begun. An ounce of forethought is worth a ton of the other kind. For instance, in the killing houses of a meat-packing concern, where a continual procession of animals is going through all the processes from "killing" to "finished quarters," running on a track of pulleys from one set of piece-workers to another, a stoppage at any point means stopping all the way through, and the expense mounts up quickly. When you multiply ten minutes lost by the three hundred men affected it is obvious that there must be no mistakes. This applies in all branches of industrial work. Let us get down to our subject, taking up railroad photography as

an interesting introduction, and fairly typical of the tasks which fall to the commercial photographer.

**Railroad
Work**

Photography plays an important part in the every-day work of the modern railroad. Some of our railroads maintain a regular photographic department for the work; others have capable men on call in different sections of the country through which the road runs; and others again give work out as occasion requires. The duties of a railroad photographer are legion,—embracing the photographing of bridges, culverts, stations, signal-cabins, train sheds, sidings and the general equipment of the road. Apart from this comes emergency work. When an accident occurs the photographer is rushed to the spot, and photographs are made from every point for the use of the road officials, or in court, if the accident brings legal trouble in its wake. Every department interested is furnished with a full set of prints bearing upon its work and, when any improvement or change is planned or other alterations are made along the road, the officers in charge have photographs showing present conditions, and views of the locality concerned, so that they can intelligently direct the work or judge of its progress without visiting the spot. The saving of time and impartiality of the evidence thus provided will be apparent. Passenger roads also need photographs showing the scenic attractions along their lines. This calls for landscape work comprising sections of the road itself and picturesque places, pleasure resorts, fruit orchards and farms, mining and industrial plants, views of the towns through which the road passes and other scenes readily accessible from the line which may have interest to the traveler. A good class of work is needed for this department and the roads are willing to pay fair prices for desirable material, so that the field is one worth cultivation from a business viewpoint. A survey of the many railroad handbooks advertised in the monthly magazines will give some idea of the scope of this field; although they do not illustrate the mechanical or technical applications of photography in railroad-ing, these belonging to the construction or permanent way department.

**Making
an Opening**

A certain amount of tact and diplomacy is needed to secure railroad work. My plan is to secure the attention of the advertising or general passenger departments first, and, on this introduction, work my way into the construction department. Thus I get a railroad friend to obtain for me a pass to some resort advertised by the road, agreeing in return to furnish photographs of the place. Once the pass is secured giving me the desired transportation, I set out determined to bring back something different and better than the road has hitherto had. Neither time, plates nor endeavor are spared in this quest. From my negatives I make a set of the best possible prints, finish them tastefully with suitable lettering, titles, etc., and they are presented to the official granting the transportation. In nine cases out of ten there follows an order for prints which will more than compensate for the work done and I have brought my work to the attention of those interested. This plan has been uniformly successful since my first attempt, when the passenger agent ordered three sets of prints from all the negatives made, gave me many after-orders from the same negatives, and has since proved one of my best customers. So much for a beginning and the value of a first impression. Once a favorable start is made, the question of securing transportation will present no difficulty and the concession will prove of great value in the year's work.

**Preparing for
a Trip**

Before starting on these railroad journeys one must be equipped with proper transportation, and, when the work is heavy, with an assistant; photographic apparatus; letters of introduction to persons in charge where the work is to be done, requesting all necessary assistance and courtesy; orders to trainmen to stop the train at whatever point may be necessary for the work, and every detail prearranged so that no one can question one's authority. Some years ago I was furnished with a list of views wanted by a New York firm of builders of railroad and road-bed machinery, consisting of steam shovels and apparatus for loading and unloading a train with dirt and gravel. To this list the general manager added a number of views he desired, fur-

nished transportation, and gave me a general letter of introduction to all the division superintendents and roadmasters. These were preceded by orders and telegrams to every one with whom I had to work. When I arrived at my destination, nearly five hundred miles from home, I found the roadmaster expecting me and a construction train waiting, subject to my orders. The result was a perfectly satisfactory set of negatives. The general manager of this line, I will add, was one of the most practical and satisfactory men I have ever worked for. It is not always that such perfect arrangements can be made, but attention to these preliminaries will make the work much easier. Keep the orders given for the different parts of the work in mind all the time, and try to have them carried out to the letter. It is absolutely necessary to have a clear understanding of what is wanted and secure the views required as the journey is made. Some of the work will be left wholly to the photographer's judgment, especially so if the first commission was satisfactory. A general knowledge of railroading is helpful, but quick and intelligent observation will supply this and enable the worker to see what can and what cannot be done.

Making it The compensation for such work
Pay varies, of course, according to the time
 consumed in making the trip and the
number of negatives or prints required. The charges
are usually so much per negative and expenses, with
a certain charge for duplicate prints. If the order is
a large one (for, say, a hundred framed prints per negative), the negatives can be charged at a very reasonable price and yet give a desirable profit. My prices
have ranged from \$2 to \$10 per 8 x 10 negative, the
lower charge being made where I could secure a large
number of negatives in a short time. When I am
working around a town I find that my railroad work
gives me a certain amount of reputation, and I manage
to pick up extra work right along. Orders for views
of manufacturing plants, buildings, horses, homes, etc.,
can be secured, usually at good prices. Sometimes in
working along a road a number of people will be
shown a print of local interest, and a great many dupli-

cate prints can be sold. In such work, always collect the money when the order is taken, unless the persons or firms are known to be responsible, otherwise you are apt to be out of pocket. In staying at large hotels, it will frequently happen that the guests would like a group, especially if it is at a resort where people from different sections of the country are spending some time together. They will pay the commercial man a much better price than the local photographer. I mention these items to show where extra money can be "picked up" and yet have none of the speculative element about it or interfere with the regular work in hand. Occasionally, too, one can make a picture of some particularly beautiful spot, and by placing a print on exhibition secure orders from those familiar with the scene who can appreciate good work. I remember meeting a very ordinary-looking man on a railroad track just after making a negative of an unusually picturesque bit of river scenery, and, countryman-like, he wanted to know what I had been taking. I explained that I had made a picture 8 x 18 inches of the scene before us. He asked: "What will a print be worth?" "A dollar," I replied, not thinking that he would buy a copy. He pulled out a dollar and gave it to me, with his address. I have been in that locality several times since, and the chance sale has proved an excellent advertisement. The picture was made for my own pleasure, but, later, I sold the railroad one hundred framed prints from the negative.

It is wise to be liberal in the use of plates, and to give more, rather than less, than was promised in the contract. The additional plates may mean many additional orders and will offer the railroad officials a better selection, which they will not be slow to appreciate.

Packing: The average railroad baggage-man
Traveling: has little respect for luggage, and gener-
Supplies ally succeeds in smashing something
valuable every trip, unless one travels
with a steel trunk well packed with "excelsior" or
other soft padding. The railroads are perhaps more to
blame than the trainmen, for the smaller stations are
rarely equipped with trucks standing level with the

baggage-car door, so that trunks and boxes are dumped from the car to the ground, often a distance of five feet, after which it is no wonder that the contents should be damaged.

Even with a permit to check the photographic apparatus as baggage, it is often better not to check the trunk on the permit, but to pay the train baggage-man to look after it and to fee the porter at the station to handle it carefully as it comes out of the car. A small fee and a good word will accomplish wonders. By being on hand when the equipment is put off at the end of the journey, many a plate can be saved from breakage. If a trunk is used for transportation it must be as strong as it can be made and able to withstand rough treatment. Its interior should have spaces partitioned for cameras, tripods and a tray for wearing apparel.

If plates are carried in the trunk, which I strongly advise against, each box should be wrapped both ways with corrugated cardboard and packed snugly with excelsior in one compartment of the trunk, preferably in the middle, so as to avoid too much weight at either end. The camera for railroad and view work should be of the compact type and contained in a long case, holding camera, six plate-holders and a tripod. This case should be fitted into a compartment at the back of the trunk. If the plate-holders are carried in another case it is a good plan to pack them with a sheet of corrugated board between each in order to avoid splitting one against the other. Plate-holders should never be carried loaded in a trunk with other articles. Nine times out of ten the result will be broken plates and damaged holders at the journey's end. It is always the valuable plates which are broken. They seem to be more brittle after exposure! When plates are taken in case lots they should be carried in the case as it comes from the factory, with iron handles secured on each end. This will make the heavy box easy to handle, and, the handles being on the ends, the plates must necessarily rest on their edges, as they should do. The case should have "Glass" marked in plain letters on every side. Be at the car door when the case is unloaded and assist in

handling it. In fact, it should never be out of sight while it is being handled. I rarely have a broken plate that has been carried in its original wooden case.

The plates, after exposure, should be packed in the cardboard boxes exactly as they came from the factory, dividing strips or separators in place, and the boxes sealed up by pasting a strip of brown or black paper around the edges. I find this precaution most valuable. Sealing the boxes prevents any moving of the plates, and it is this moving which causes them to break. Keep the case full, even if an empty box or two must be carried to fill up. During my trips afield I carry at least one empty box of each size of plate I use, being careful that all the original packing is left in it. After I have exposed the dozen plates in the holders, I number them in the dark-room with pencil on one corner to correspond with my note-book, putting the lowest number at the bottom and packing upward until the box is full. I close it, mark on the outside "Box No. 1, Nos. 1-12, last on top," and seal it. I generally carry twelve 8 x 10 plate-holders containing two varieties of plates. The holders are in two sets, of six each, marked so as to be readily distinguishable. Non-halation plates are carried in one of the sets and the other variety of plates in the other set of holders, and this plan is invariable. When the subject needs a non-halation plate I find my plate by the kind of holder, without referring to the record. The sides of my plate-holders are numbered with the Roman numerals I, II, III, IV, etc. I always begin with the odd number in making my exposures, and where two exposures on the same subject are made I can come home and know without the record which I exposed first.

Exposure	I keep a careful record of my expo-
Record	sures, subject, light, time, date, etc., so
	that when I come to development I have

a clear idea of the exposure given, just as I would if I were taking each plate from the holder at the time. One's memory should not be trusted to remember these details. If any doubt exists at the time of exposure it should be jotted down in the note-book as a guide in development. On a trip exposing two hundred plates one's memory would often be at fault. A careful record

is the surest method of avoiding mistakes and correcting troublesome errors.

**Focusing
Screen**

Always carry an extra ground-glass, packed with excelsior, in a plate box; some paraffin paper; a small bottle of LePage's glue, a screw-driver, a "handy tool" set, twine, a tube of paste, and extra wrapping paper. In the event of breaking both ground-glass screens, which seldom happens, the paraffin paper may be ironed on a piece of plain glass. On one trip an 18 x 22 ground-glass was broken, and in the town where I was not a piece of ground-glass could be found. Paraffin paper and other substitutes were not to be had, and I was 400 miles from my base of supplies. After consulting a druggist, we hit on the expedient of dissolving resin in wood alcohol and blowing it over the glass. This gave a very fine-grained "ground" glass, and served its purpose admirably so long as it was not touched or rubbed, but the least thing would scratch it. A solution of 120 grains of white wax in 1 ounce of ether would probably have been better. Necessity is certainly the mother of invention with the photographer on the road. It is best to be prepared beforehand for all such emergencies. The paraffin paper takes up no room and makes an excellent substitute for the ground-glass. It is, however, more transparent than the focusing screen and the image is apt to appear clearer. Because of this, one is apt to undertime subsequent exposures, unless allowance is made for the difference in the illumination of the image.

Lenses A complete equipment of lenses for commercial work will, of necessity, involve considerable expense, the impor-

tance of focal length in securing correct drawing and perspective making it essential to have a fairly large assortment of lenses to choose from in order to meet the requirements of different classes of work. This expense can be modified by careful buying, and new lenses can be added as the occasion requires. As a matter of course, the anastigmat type of lenses is preferable where the expense is not too great. At the same time, where extreme speed is not called for, much good can be done with the less expensive rectilinear or sym-

metrical lenses. Good lenses of this class can now be obtained at remarkably low prices, the whole world being apparently urged by mad ambition to possess an anastigmat. The best negative I have yet made, a two-section 18 x 22 panoramic view, was made with the rear combination of a Gundlach RR of 20½ inches focal length. The definition and illumination of the image were perfect; the exposure was two minutes, with a diaphragm made of cardboard blackened, and equal to about $f/64$. I have also seen some clever negatives of furniture made with a single Waterbury lens costing \$5.50. It is the man behind the lens, rather than the lens, that counts. And yet, to cope with whatever conditions may arise, as well as to meet special requirements demanding extreme speed and critical definition, the anastigmat is a necessity. In order to avoid the bulk and expense of many lenses of different focal length, each equipped with a shutter, I provided myself, years ago, with a set of Zeiss Series VIIa convertibles. These offer in a single instrument lenses of three different foci, and one can at any time add to these available foci by obtaining new elements which will fit into the same tube. My favorite set is made up of two 14-inch, one 16½-inch, and two 19½-inch elements. These I carry in velvet-lined leather boxes (like pill boxes), so that I can distribute them about my person, carrying the tube on the camera or packed with it. I have also worked with the new Cooke lens and find it a very valuable addition.

The diaphragm shutters are doubtless efficient and desirable, but, for some reason or other, I have always preferred and used the Thornton-Pickard shutter. It seems to stand any amount of wear and jolting. I have made good negatives with it after it has been split into two pieces and tied together with a piece of string—an emergency case, of course. An extra bulb and teat should always be carried, as useful in case of accident.

Among the many good plates in the market my personal choice is the Seed plate. This, of course, is simply a matter of opinion; any reliable plate will give good nega-

tives if handled intelligently. For my railroad work I take with me supplies of Seed's L Ortho and the L Ortho Non-halation, and very rarely indeed do I use a screen. Possibly a color filter is helpful, but, save in extreme cases, I fancy the advantage gained in general outdoor work is offset by the inconvenience involved in its use. For color reproduction, copying paintings, etc., the screen is of course essential to the best results.

The choice of a camera is a matter of individual opinion. I have used the Rochester Optical Company's Empire View Box with great satisfaction, and their Perfection holder is, to my mind, as good a plate-holder as the market affords. The cameras made by Folmer & Schwing and the Century Company are quite as good, those of F. & S. being more substantially built than the general run of instruments, resembling the standard English cameras in this particular. Both camera and tripod should be rigid enough to "stay where they are planted," and to withstand more or less wind. I do not use a tripod where the head can be taken off the legs. If it is not shaky when it is first used it will soon become so, and I have seen this class of tripods give half an inch when the screw was tight. A heavy ash tripod with the head fastened to the legs is the only satisfactory one. For a focusing cloth I use dark cotton flannel about five feet by six. It does not take up much room and is sufficiently opaque.

Changing Plates I have tried changing bags, but for large plates they are not satisfactory and I prefer to change my plates in the most convenient place offered, often using my room at night. Where there are no shades on the windows I get under the bed-covers and change my plates there. This will start perspiration in summer-time, and damp fingers must be kept severely off the emulsion. Plates should be packed face to face and back to back, and under no circumstances pack newspaper between them. It is better to use no packing whatever, unless it be dividing strips which originally separated the plates. Those sent out with the Seed plates are useful for this purpose. A little practice will enable you to do a good

deal of skilful packing even in absolute darkness. I never burden myself with a ruby lantern.

Lumber Mills In photographing manufacturing plants, much of my experience has been secured among the lumber mills of the south, where extensive pine and cypress forests are located. This work usually comprises photographs of the virgin forest, bird's-eye views of the plant, and the processes of lumbering from felling to loading for export. A glimpse of these processes is given in the illustrations sent with these notes. The photographs are made on single plates and two- or four-section panoramas for the bird's-eye views.

Working in and about a lumber mill is very pleasant in good weather. The long-leaved yellow pine forests are beautiful, there being no underbrush and many of the trees rising seventy-five to ninety feet before the first limb is reached, with a diameter of ten to eighteen inches. The living in these southern lumber camps, however, is desperately bad, and a visit of a few days usually ends in a violent attack of dyspepsia and similar troubles. The living quarters, too, are uninviting, so that one hurries through the work and is glad to get away, despite the fascination of the woods.

When employed to photograph a lumber mill the photographer is given a list of the views desired, a certain amount of work being left to his judgment when he has seen the place. A letter of introduction to the superintendent of the plant is also given, in which all necessary assistance is provided for. On arrival at the plant a day should be spent in going over the work proposed with those in charge, learning the best time of day for the various features, interiors, bird's-eye views, and when to take the logging train to the "front," or woods, where the finest timber is found.

A Bird's-eye View Having located the point from which a bird's-eye view or panorama can be obtained showing the plant and its operation, the lens should be carefully chosen to give the desired amount of view on the given number of plates needed for the panorama. The elevation of the camera is an important point. If this cannot be managed by

natural means, a scaffolding will be necessary, from twenty to sixty feet high. In building this, insist that it be constructed with a flaring bottom and the timbers braced with "cross-braces," so that you can work on top without fear of its collapse or other discomfort. The working platform should be at least five feet square, with a stout handrail thirty inches from the platform. This platform should be of two-inch boards nailed to 2 x 6-inch scantling set on edge. If the camera needed is large, say for 18 x 22 plates, have a table built for use as a tripod or stand and the top leveled with a spirit-level. To reach the platform a ladder built at the side of the scaffolding will serve the purpose, the camera being drawn up with a rope. If timid about climbing any distance, have some one go up ahead and pass down the end of a rope with a large noose, which you can put around under your arms. Instruct the man at the top to give the rope one turn around the rail, and as you climb keep pulling up the rope. In this way if you lose your hold you cannot fall. Come down with the same precaution, reversing the method. The platform and scaffold must be well constructed so that you feel at ease and secure, or the work will not turn out satisfactorily. Usually it is sufficient to express a desire for such precaution to secure its provision, those in charge being as chary as yourself about risking themselves on an insecure scaffold. The artistic view will not always be the one that will show the operation and scope of the plant to the best advantage. Since the pictures are usually intended for advertising purposes, this point must be kept in mind.

A desirable point for the bird's-eye view is one which will include a train of logs at the skidway, an ox team in sight, other teams hauling lumber, and men piling logs or boards here and there. When all the preparations are completed and a favorable moment arrives, make the exposures without allowing any one to be aware of the fact. In this way an animated and natural view of the scene can be obtained. The exposure should be as short as is consistent with good negatives, this depending on the light and other factors. In making a four-section panoramic view I prefer to expose six plates,

giving duplicate exposures to the first two sections. These extra plates provide a guide to correct development. Panoramic section negatives should, of course, be developed by time, as each one must be developed separately, and yet all four must have exactly the same density. The method of manipulating the camera for these sectional negatives is clearly given in Mellen's "Panoramic Photography." After exposure the six plates should be removed from the plate-holders and carefully packed, face to face, in their box, and, needless to say, this box should be the photographer's special care on the home journey.

To reach the woods where the timber is secured it will be necessary to take the logging train as early as 4.30 A.M. This will ensure reaching the trees when the light is most favorable and obviate waiting for hours for a good light later in the day. Similarly, in working around the mill, in making interiors and such features, the photographer should think out his problems beforehand and take time by the forelock. In laying out his plans he must be master of the situation, with good reason for all requests made. Above all, patience is necessary. The world moves slowly in the south.

Avoid getting to a lumber plant on Saturday. It may be pay-day, or the mill may be overhauling, or there may be a contract to complete. See that the visit is favorably timed to fall in with the work in hand. Work just as quickly as you can get good negatives, but do not permit yourself to be hurried beyond that point. Failure and dissatisfaction always result from attempting to cover too much ground in a day. In giving quotations for this work, therefore, allow an extra day or two for delays, bad weather and similar interferences. In asking for men to assist you, ask only for what you really need and object to any more than are sufficient, so that you may not be hampered by idle onlookers. A comprehensive survey of the plant before beginning work will give a clear idea of the industry and its salient points, and in this preliminary survey the photographer can plan his work to a nicety. Having once decided upon a plan covering the contract, do not deviate from it without urgent reason.



LONG-LEAF YELLOW PINES, LOUISIANA
Edward J. Davison



METHOD OF "FELLING" TREES IN THE SOUTHERN STATES

Edward J. Davison

Cattle Success in photographing live stock depends upon the photographer's knowledge of the animals concerned. One must know something of the good points of the various breeds in order to know when these points are showing themselves before the camera. For instance, what the stockman calls "a beef animal" must be photographed from the front to show all beef; a Jersey must have the rear most prominent so as to exaggerate the udder. To have an animal standing just right requires a quick eye, as the change in position of a foot will often throw the back line out of shape. The position of the head must be just so high or the back will not be right. Raising the head too high will make the back hollow; this fault also appears if the feet are too far back and forward. In the stock-breeder's language one must know when an animal is "on its feet," which means when each foot is supporting its proper share of weight.

A long-focus lens, say 14 to 16 inches for an 8 x 10 plate for single animals, is a necessity; it should be quick working, i. e., have a large working aperture. A reliable shutter and quick plates are equally essential; for moving objects a focal plane shutter, of course. Unless a long-focus lens is used the views are apt to distort when quartering pictures are made, and such views are often required to show the spread of the legs, and the width of hind quarters and back. In photographing beef animals it is desirable to show the belly as near the ground as possible. There are two ways of accomplishing this. One way, and this should be adopted where it is practicable, is to stand on an elevation high enough to show the back. Another plan is to have the animal stand in grass. In the absence of grass, straw spread on the ground will serve. A good way to show an animal's back is to work from an elevation and have the animal eating off the ground, facing the camera. This will throw the back up and you will get all there is of it. The backs of some Hereford cattle are enormously broad. Beef cattle are rarely difficult to photograph, as they are heavy and sluggish, provided they have had "proper training." This differs greatly with the herdsman, some being gentle and kind

and their animals consequently docile and easily handled, while others, who are rough, lose their patience and their animals are timid and restless, being afraid of a thrashing.

An animal on his own heath is at ease and acts naturally. At a show he is excited and his attention is constantly divided, the old bulls especially being ready to make trouble on slight provocation. These fine cattle are kept in barns and carefully looked after as valuable property. Bulls that are worth from five to ten thousand dollars must have every attention, hence they are like spoiled children and just as contrary when excited. I have done a great deal of photographing among cattle at shows, and the difficulties are many. Perhaps the wind will be blowing a gale of dust, or the flies may be so bad that the animal keeps head, ears, tail and feet going, and one must be on the alert to take advantage of the occasional quiet moment. The head must be erect, ears forward, etc. The best way to secure this result is to focus your subject and then have another animal led out in front. While your animal is in the first moments of his curiosity make the exposure, for in the next instant he will get restless or lose interest altogether. A good remedy for troublesome flies is to use on the animal "Flychaser," a patent ointment or liquid to be had almost everywhere.

Panoramic Views I have made some panoramic pictures six feet long of cattle, the animals scattered all through the view without a man showing and grouped in an easy and natural arrangement. In making photographs of this kind, the animals must be scattered across the entire field of view if they will permit it (generally they will not). Sectional negatives are then made, leaving plenty of lap at each end of the negatives, so that the joining of the sections can be made at any point without cutting a cow in two. Cows or heifers are almost exclusively used in these pictures; never a bull with the cows. If your customer does not know this is wrong, do not let him make you err by having one in the picture.

These panoramic views may have to be made from an elevation: a lumber wagon with boards across the

bed will do. Decide how much of the scene is to be included, set up the camera, decide the number of plates to be used, and, when that is settled, drive a stake of wood at each joining point on the ground; so that while waiting for the cattle to take a desirable arrangement you will know without consulting the ground-glass when they are on the plate and within the joining points of the view. These stakes should not be far enough away from the camera to come within the angle of the lens and so appear in the negative. I use two sets of these stakes, one to show the joining and the other to show where the plate started and where it stopped. These matters will suggest themselves to the worker as he gets practice.

Where only two plates or sections are to be used, a tree can often be used to join the sections and the cattle kept behind it. In such a case, put all the cattle within the first section, and expose; drive them all over into the other section and make the second exposure. You can thus increase the size of the herd twofold! While setting the stakes, the cattle can be arranged for each plate. To do this successfully they must be separated, and not show a "bunching." It will usually require three or four men on horseback to hold them. After they find they cannot move they will gradually settle down,—some eating, others lying down, etc. When everything is favorable give the horsemen the signal and they will quietly leave their charges. Their presence would be a disturbing element in the view. This procedure must be repeated for every plate, so that one can figure on four or five hours' work for each scene, with as many negatives. Make, at least, two exposures for each section, as the cattle may change their positions. The plates being interchangeable, providing all have the same time and development, sometimes a view can be improved by using the first exposure of section one and the second exposure of section two.

Cattle are seldom in as good condition in the early spring as during the latter part of summer or early fall. The time chosen should be late enough for the cattle to have good coats. Plenty of fur helps wonderfully.

The kind of assistance one has makes a difference. Two persons who have an intelligent idea of what is required are better than a dozen clumsy fellows who will do the wrong thing every time. More patience is lost over "the help" than on the cattle. Before beginning work, get all the assistants around the camera and explain what is wanted, so that they will understand.

Horses have little attraction for me.

Horses Usually the photograph is to cover a team of horses or a saddle-horse, the owner being a gentleman of sporting tendencies whose whole extra time is devoted to his few, or perhaps one, high-strung, beautiful animal. In his daily intercourse with the horse he will observe at times a beautiful curve of the neck. When you come to make the photograph that curve will not come up, or the horse may not be on his good behavior. He may have been kept for several days without exercise; he comes out of the barn steady enough, but the proud owner wishes to show him off, after which you may make the photograph. He is taken a rapid spurt around the block, gets back right up on the bit, and no amount of patience will get him quiet enough for a pose.

Again, the flies may be bad, or the sun glaring, and you have in the first place head, ears and tail going, and in the latter chalk and soot effects. This is the unpleasant side of the work. The pleasant side is encountered in dealing with the reasonable business man who has a few fine horses, well handled, and who compels every one about him to do whatever you say, knowing that to get good results you must have favorable conditions for success in your work.

The most desirable position for a single horse is one which shows the animal standing on all four legs, a good line to the back, and the head erect, with ears forward and attention alert. To get this position, set the camera squarely facing the horse in side profile, but sufficiently toward the horse's head to get a view of the four legs. To secure the right poise of the head, get an assistant to stand with a barrel containing a brick, or other device to arouse attention, about thirty feet away in the right direction. When ready for exposure let the assistant



"SKIDDING" BY HORSE TEAM, ARKANSAS. SHORT-LEAF YELLOW PINES
Edward J. Davison



LOADING LUMBER AT PORT ARTHUR, TEXAS

roll the barrel away from the horse. This will awaken attention and alertness in the animal, and you will get just the poise of head and neck desired. This plan was suggested by Mr. John Rösch years ago, and I find it invariably successful. Sometimes the horse, if left to himself at ease, will assume a pleasing position without any effort. The less fuss made with horses the better.

Those intending to take up the photographing of live stock should make a specialty of cattle. Groups pay better than single animals and are not so difficult. Many breeders prefer sketches of their bulls or cows, even though they do not correctly represent the animal. Some animals have a defect here and there, and these defects must be hidden; this the "artist" can do,—the photograph tells the whole truth.

Those who wish to make photographs of horses can get excellent studies in this class of work from Shreiber & Son, of Philadelphia, who have been in this particular line of business for over forty years and who have few superiors. On the pictorial side of animal photography Charles Reid, of Scotland, and his son, William Reid, of New Zealand, have done notable work. Their addresses can be had from "The Breeders' Gazette," Chicago, and a supply of their photographs will suggest many things to the enthusiast. Photographs of cats can be had from Miss Bella Johnson, Monroe City, Mo., who has given much time and effort to this specialty. She has some clever studies well out of the ordinary in character and interest.

Dogs The photographing of dogs for illustration or other general purposes sometimes falls to the commercial photographer, and a few hints about this specialty may be useful. As far as we are concerned here, the work will be largely confined to "show" dogs on exhibition, or dogs at "kennels" or country houses.

A certain amount of familiarity with dogs and their points, differences of breed, characteristics, etc., is helpful, if not essential to success. Patience, quickness of observation and a genuine interest in the results are absolutely necessary. Dogs are as sensitive as children about new faces and strange voices, and they are quite

as quick to analyze the spirit of the photographer. Then we will often have to contend with the owners. Speaking of these points, Mr. W. H. Mapes, an experienced worker, says truly: "Most dog owners want the picture to show the ears erect, and the animal on the alert, just as a great many people insist on having children taken full length, standing. And this, notwithstanding the fact that many dogs—pugs and spaniels especially—are so fat and lazy from overfeeding that they can hardly move, and seem threatened with heart failure every time they climb a flight of stairs. The most frantic efforts on the part of the photographer will hardly rouse such subjects from their state of torpor, or cause more than a few sleepy winks or a stupid stare. When it is my lot to get such a subject to work with, I proceed to handle him without gloves. I growl, bark, yelp, slam doors, cry like a cat and scratch parlor matches until the animal is actually tortured into some semblance of interest and activity. Other dogs, the nervous, intelligent fox terrier for example, will hear and respond to the slightest sound, and are so quick that I have spoiled many exposures by opening the shutter too quickly and causing the flaps to rustle, and the dog to instantly change position. Fox terriers require the most expert handling. A slight scratching on the camera box or the crumpling of a piece of paper in the hand is usually sufficient to fix their attention and enable their owner to get out of range of the instrument; and often the sight of a rubber ball will throw them into a jaunty, saucy position, which is superb in showing the characteristics of the breed; for a photograph of a dog, whatever the breed, must show that he has blood of good quality in him, must show his style, his carriage and his good points, or else it is but little more than a failure. Setters and pointers are best posed with a kitten or pigeon to fix their attention. Their owners usually ask that they be taken at a point, but in all my experience I have never yet seen one in front of the camera take a perfect point. There is always something a little different from what it should be that impairs the quality of the picture and causes disappointment. It is quite necessary that the dog be

well trained in using live objects to attract him, for otherwise he may create havoc with the backgrounds and accessories, if in the studio, in his attempt to seize the object. I once saw a great Dane dog knock a trainer down in his attempt to seize a kitten which the trainer was holding, and which escaped only by climbing a tree. Newfoundlands and mastiffs are generally easy to handle, and bull-terriers likewise, but the best dog of all to photograph is the Scotch collie."

The apparatus required will necessarily vary with the circumstances. For work at the studio the regular studio camera will serve, but the portrait lens should be replaced by an anastigmat with a silent shutter working inside the camera. A stout view camera, with the same lens and shutter and a substantial tripod, will best serve our purpose when the work is to be done at a show. This, by the way, is the worst of times and places for dog photography, and the work should be done by flashlight, as detailed in THE PHOTO-MINIATURE NO. 29. For kennel and outdoor photography the outfit should include both a view camera with its tripod and a hand camera, preferably of the twin-lens or reflex class, fitted with a shutter of the Prosch Athlete or Triplex sort. Quick plates are a necessity, as the exposures are invariably shorter than one would like to give. In the development of these brief exposures, I have followed with much success the method given by Mr. John Rösch some years ago—a method he uses in equine photography. Prepare a solution of carbonate of soda, hydrometer test 20. To one ounce of this add ten ounces of warm water, winter and summer alike, and immerse the exposed plate in the dilute solution for three to five minutes. After this soaking develop with a standard pyro developer. The result will be a negative possessing both detail and contrast sufficient to yield a good print, always supposing the plate to have received a reasonable amount of light action.

Dogs in the Studio Whenever possible it is advisable to have the dogs brought to the studio, i. e., when they are on exhibition in town. In this way the excitement and bustle of the

show does not interfere with the work, and more adequate preparation can be made.

For photographing dogs without their owners I have in the studio a tall table, three feet six inches high, the top of which has been thickly coated with warm glue and then sprinkled with coarse sand. A board, similarly coated, hangs in front, to hide the legs of the table. A plain screen, either lighter or darker as best suits the dog, is hung behind. The dog stands on this table. If the dog wears a collar or is used to the leash let his master hold him, but remove the chain or strap and use instead a piece of very flexible, dull copper wire. If this shows at all it is only slightly, and can easily be spotted out. The owner may stand behind the background, looking over it, and, of course, well above the top of the picture. More often the holding should be done by some third person, the owner, meantime, talking to the dog. When the dog is in position, the owner, telling it to stand still, walks slowly out of the range of the camera. If the dog does not watch him with sufficient alertness, the necessary expression of interest can be had by breaking a piece of biscuit or by one of the many means suggested in an earlier paragraph. Focus as soon as the dog is in position, draw the slide and hold the bulb ready to expose the plate at the right moment. Some plates will doubtless show movement, but if hesitation and wondering whether the dog will move be put aside, you will get three good negatives out of six plates.

Dogs Before photographing dogs at a kennel or country house, it is well to go over the place and select a desirable site for the work. A grassy bank offers many advantages as a background, either for a single dog or a pack. For work done in the open the reflex camera is indispensable, as we may have to "follow the hounds" until the right combination is secured. It is important not to use a lens of short focal length in this work, as peculiar and undesirable distortions will result.

Useful hints on the photographing of domestic animals can also be found in *THE PHOTO-MINIATURE* No. 39.

**Cemetery
Work**

To the beginner in commercial photography no work will seem easier than the photographing of tombstones, monuments, vaults and grave markers, and he will not know why his work is unsatisfactory until he is told that his horizon line is entirely too high.

For the average monument the camera should not be over eighteen inches from the ground. This will make the object stand up bold and appear in much better proportion. In some cases the camera should be still nearer the ground, and it is necessary to have a tripod that will shorten, so the camera can be fixed as low as twelve inches from the ground. A swingback will be necessary and the lens should be one of moderate length of focus, say 10 inches for an 8 x 10 plate. Excepting where the surroundings will help the general effect, the monument should fill up the plate well. It is also well to stop the lens down only so much as to get the object sharp, leaving everything else out of focus. Non-halation plates should be used. Some monuments photograph better on cloudy days and others on bright; this is a matter purely of choice, as is the detail of lighting. If the inscription is to show, the strongest light should come from one side rather than directly from the front, to secure relief and shadow. The opinions of people will differ, some wanting work done on bright days so as to get the shadows, others on dull days, so as to avoid them. The manufacturer usually prefers sunshine, on account of the additional life the shadows give to his work.

The photographing of decorated graves is not a subject that every one cares about. The sexton should know beforehand that the photograph is to be made and the grave should be neatly filled and covered with sod if possible. It is desirable that flowers should be so arranged as to hide the newly made grave. Many graves are covered over with evergreens, and this affords an excellent background for the flowers.

**Flashlight
Work**

No branch of commercial photography is so little appreciated or understood as flashlight work. A full understanding and knowledge of the multitude of uses to which it

can be put makes it a powerful ally of the commercial photographer, and renders easy of accomplishment many things which cannot be done without it.

The kind of apparatus necessary varies according to the subject in hand.

Apparatus Where no persons or movements are included in the view, a very good lamp is the Prosch storage lamp, in which only fused magnesium metal can be used. Even where one faces a window this lamp will be useful in connection with a non-halation plate. In cramped quarters the lamp is a necessity. Next come the machines which use the compound or explosive flashlight powders, such as Luxo, Light and similar brands. Of this type of machine there are several, such as the Nichols machine, using alcohol, and the Thayer machine, using an electric battery. The former is a practical and inexpensive machine, not easily put out of order, portable, convenient and having considerable power. It is large enough for all ordinary rooms. These machines can be used anywhere, but where an electric current is to be had the machine invented by Pingree, of St. Louis, is by far the best I have used. It is portable and easily manipulated after the operator has some knowledge of the handling of safety fuses, and electrical fittings in general. This machine consists of a number of arms on stands, connected by cords to a switch block, which is operated by a bulb, instantaneously with the lens. Parts of the machine can be located in different parts of the room, and all fired together as a battery. Properly handled, there is no hesitation between the squeeze of the bulb and the flash with this machine.

In making flashlights the essentials are

Lenses a reliable machine, a fast plate and quick lens; my preference in the latter is an anastigmat of say 6- or 6½-inch focus intended to cover a 4 x 5 or 4¼ x 6½ plate for the interiors of rooms, and used on 6½ x 8½ and 8 x 10 plates respectively, instead of the regular wide-angle type. They need but little stopping down, and the difference in speed is tremendous. I have used for years a 6½ x 8½ Zeiss Series V, for 8 x 10 plates, and where there are

no near objects it will cut the whole room sharp at full aperture. It is, however, quite slow (F18) as compared with a Series IIa Zeiss for $4\frac{1}{4} \times 6\frac{1}{2}$ plate working at F8. A splendid lens for flashlight work is the Zeiss VIIa Convertible Series, combined focus 8 inches, F6.3, for 8×10 plates. In almost all cases this lens embraces a satisfactory view angle and, with stopping to F8, will give sufficiently sharp definition for all practical purposes. Where much work is done a lens of this rapidity will save its cost in a year in powder, and where very large rooms are to be lighted it is a necessity. I recall a commission, that of making a flashlight interior of Convention Hall, Kansas City, size 198×316 feet, which could not have been illuminated with a wide-angle slow lens and several times the amount of powder I used. With the Pingree machine, two stands, six arms and 24 fuses, and the use of 7 ounces of Luxo, I had a well-exposed negative, well defined all over at stop F8 with the lens just mentioned. Some help was given by several arc lights in the hall, but the duration of exposure was so short that they did not count for a great deal.

As to lighting the subject, the proper Lighting position will suggest itself. A light properly placed for a piece of machinery is seldom correct for a portrait, and vice versa. For that reason I try, if possible, to avoid having people included in views of machinery. A chalky face, with flat lighting, is generally the result. Where a class in school is taken, the light should take the position of the skylight, a flash machine with the full charge on one side, and another near and above the camera with a charge of powder just sufficient to break up the shadows from the other machine. This will give two catch lights in the eyes, one of which must be etched out. A reflector will also help in breaking up the shadows.

In the case of large rotundas where one corner is dark, a time exposure should be made, the lens capped, the flashlight machine placed behind some nook, lens opened and the flash given. Daylight and flashlight go well hand in hand when properly managed.

The Low shutter is about as good as any for this kind

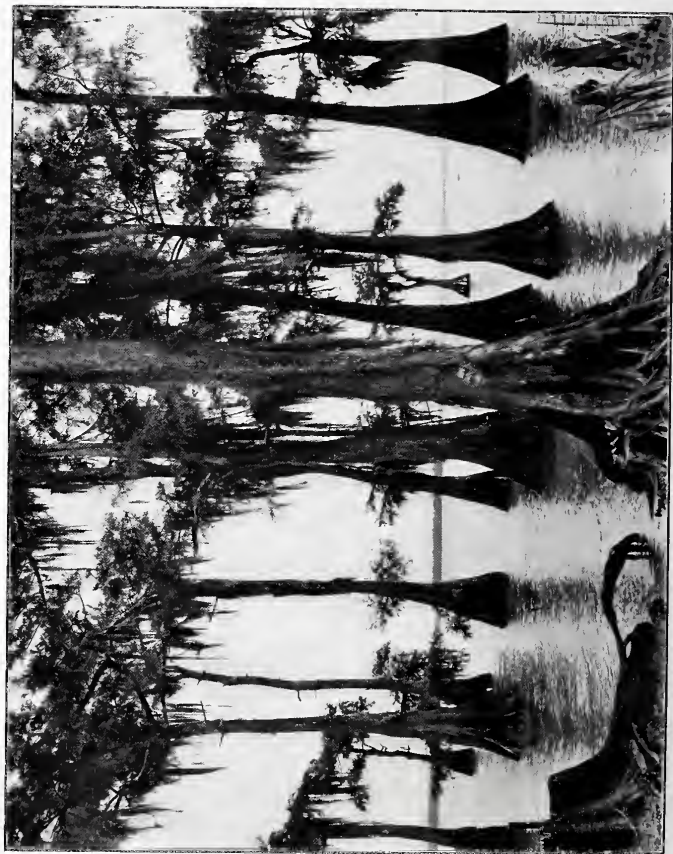
of work. Have a piece of wood secured to it and a hole cut into the wood the size of the lens. Thus it can be used on the hood of the lens if necessary. By having adapters the shutter can be used on several lenses, and on cameras having front boards too small to allow of using behind-lens shutters. Among flash-powders, I prefer Luxo to anything since the day of the Blitz Pulver. They are all explosive and, therefore, dangerous, and should be used with the utmost caution. Where a powder is used that is hardly sensitive for use with a light electric current it can be made more responsive by using a small quantity of gun cotton with the powder. Caution is necessary in this detail.

Some years ago I made quite a specialty of photographing chickens by flashlight. The best method is to stand the chicken on a table in straw; place the background far enough away not to catch any shadow and, when the chicken is posed, make the flash. It is the only method, aside from sunlight, that I have found satisfactory, and I seldom have any movement shown. There is the same trouble in this as in photographing animals—you have the fancier's knowledge of the points of the chicken to contend with.

The so-called ray filters have little value except in preserving the blues in flowers and sky; where an ultra blue is to be photographed, as in copying a blue print, they are practically useless, nor have I found them to give much advantage in copying yellows and greens. My experience has been that several screens of different densities are necessary, the lighter or lemon color for photographing ordinary blue or violet, and the darker or orange for ultra blue, orange and deep greens. They should always be purchased from some one thoroughly versed in such matters, and calculated for the plate to be used. Those without metal mount, to fit in grooves at the back of the lens inside the front board, are preferable. Any one of ordinary skill can put small cleats on the inside of the front board, to hold them. The screens with metal mounts are generally used on the hood of a lens, and require adapters to



OAKS AT NEW IBERIA, LOUISIANA
Edward J. Davison



CYPRESS TREES IN GRAND LAKE, LOUISIANA
Edward J. Davison

make them fit more than one lens. The screen should be placed squarely with the lens. Of course, it is understood that light filters or color screens must be used with orthochromatic plates. The length of exposure varies with the density of the color of the screen and the speed of the plate, being from three to fifteen times the normal exposure without screen. For the ordinary worker, who rarely encounters a difficult color problem, the Seed L Ortho plate, or the Cramer Slow Iso, used without screen, will serve every purpose. These hold the blues and take care of the greens and yellows in a satisfactory way. What is gained by the screen in some instances is more than balanced by loss or exaggeration caused by its use. In using ray filters with some makes of plates there is a tendency to exaggerate the yellows, the result being too light. With red sensitive plates an additional "safe light" must be used in connection with the developing light. I have used the Cadett Spectrum plate in connection with the Ives Kromskop camera and had the best results in developing by using the time method, so that no light whatever fell on the plate, which was covered during the entire process of developing. This, of course, requires approximately correct timing, but the exposure is so slow that there is a great latitude in timing. In photographing flowers, with the exception of the American Beauty rose, with its blue "bloom," it is not practicable to use a color-screen on account of movement in the flowers. Where there are tender stems to contend with, the Seed L Ortho or Cramer Medium Iso plate will meet every requirement.

Where contrasts are met with, such as white and black or dark shades, or where a strong light cannot be avoided, a non-halation ortho plate will give everything without a filter. Oftimes what is gained in one point in a negative by the use of the screen will be more than offset by the loss of the other details. Before using any screen it is well to know fully what needs a screen and what does not; then figure on the gain or loss and the general effect of the negative with and without, using or not using a screen as the general result will justify,

Copying
Paintings,
Drawings

For work having color, orthochromatic plates and the color screen are essential. Where there are no ultra blues or violets and only greens and dark browns, the Seed L Ortho and Cramer Slow Iso plates without screens will answer every purpose. Any lens of moderate length of focus will serve our purpose, but an anastigmat will give the best results. For paintings having delicate colorings a screen of medium depth is indicated, but where purple or sky-blue are met with it will be better to use a deep orange screen. Continental commercial workers copy paintings in direct sunlight. This is very necessary where the painting is old and many of the shadows very deep. Whether copied in the sun or in the studio, it is necessary to get plenty of light into the painting. The direction of the light must be such as to give no harmful reflections, and sometimes this is very difficult to arrange. A light that will avoid reflection will often illuminate one side of the picture more than the other, giving uneven illumination. A good plan is to have a copying stand where both camera and picture are held by the same bed, such as that illustrated in THE PHOTO-MINIATURE No. 13, the stand being on rollers, so that camera and picture can be turned first in one direction and another until the proper lighting is seen. This method holds good also with any picture having a glossy surface. Where pictures framed under glass are to be copied, the glass must be removed unless one has lights of equal strength from both sides similar to those used by process workers. Simple combinations can be made with Welsbach lights, reflectors on each side, and the lights carefully cut off from the lens. Another good method with small articles is to lay them on the floor and look down on them with the camera. Folmer & Schwing have a vertical stand which is helpful in this work. Where drawings and other subjects having a dead surface are to be copied, the light can fall squarely on the subject, care being taken to have it even. For black and white engravings, having line work and great contrast, a Process plate will yield the most satisfactory copy of such a subject. With proper handling, negatives similar to wet plates can be had on these plates. They

do not seem to have good keeping qualities, so a small stock only should be kept on hand. In copying a painting I would advise a negative to be made with and another without a color screen. A few tests of this kind will soon educate the advanced worker so that he can decide just what he wants as soon as he sees his subject. My plan for figuring the exposure with a screen is to use as a basis the time required for a normal exposure with an ordinary plate. Focus without the screen, stop the lens down and determine how much time you would give without the screen. Then slip in the screen, open the diaphragm, to see if the screen has changed the focus any, stop the lens down to, say, F16 or F32, and multiply the time of the normal exposure by the number of times normal exposure the screen requires, and you will get at the exact time exposure needed for that plate and screen. Thus, using a Seed 26x plate, the time was, say, 60 seconds. A medium screen would require 4 times that, or 240 seconds=4 minutes; an orange screen 10 times, or 10 minutes. The Seed L Ortho plates have the same speed as the Seed 26x. Of course, in using a screen there is considerable latitude in exposure, just as there is with a slow plate, and a few seconds either way will not count much. It is better to give plenty of exposure rather than too little. This method of getting the exposure time for the screens will work with every plate. I am a user of slow plates rather than the rapid brands, a Seed 26x covering most of my needs. A slow plate has more latitude, both in exposure and developer, than a rapid one. Where a painting has great contrast it is better to use a non-halation ortho plate with a screen. This plate softens the chalky lights and makes a soft negative where a single-coated plate will give somewhat harsh contrasts.

Photographing Bottles When photographing bottles and small articles, where it is desired to have a perfectly white ground, and where it is difficult to block out the background, an excellent way is to use a ground-glass for the background and get the light through it from a window at the back. Where a window cannot be used I arrange a mirror to reflect light upon the ground-glass.

The uprights supporting the ground-glass must be free and clear between and have nothing to obstruct the light coming through the ground-glass. Sometimes a background of white cardboard can be lighted from above, but the other is such a simple plan that I would advise its use. Where the oval or round surfaces of the bottles act as mirrors and reflect the angle bars of the skylight, a screen of tracing cloth should be placed between the camera and the skylight to cut off these marks. This precaution is necessary in a great variety of work in order to avoid harsh high-lights and images reflected into the articles themselves if they are polished. Do not try to do away with every high-light, however, for that would leave a flat-looking print.

Chinaware In making photographs of chinaware,
Bric-a-brac bric-a-brac and similar small articles for
commercial purposes, it is necessary to

preserve the design, form and details of the originals. I know of nothing which will accomplish this so well as an arrangement of movable shelves lined and edged with black velvet, on which the articles are arranged so as to show their valuable points. The illumination should be secured by light coming through tracing cloth. This will kill reflections and soften or obliterate shadows.

Among the most difficult lines brought to the studio of the commercial worker, that requiring the largest amount of skill and patience is decorated china having a polished and oval surface. One must use an orthochromatic plate, of course, and sometimes a color screen. About the only light that can be used is a side or top light, or both, coming through tracing cloth. This will diffuse the light and prevent a patch of high-light often right in the decoration. A streak of high-light on the edge and handle of a cup and saucer is an advantage. This style of lighting will show a roundness and softness not obtainable in any other manner. If one is not familiar with the correct position for such articles, it is best to consult some catalogue and find the standard method of presentation or display before attempting; and I would like to emphasize the necessity for sticking to standard positions with almost everything the commercial photographer gets in his shop. There is a right

and wrong position for everything, and much time will be saved if the photographer finds out beforehand just what that is. For instance, a cup and saucer must show the back as well as front edge at the top, so that it must be tilted a little toward the camera, or the camera look down on it and the swingback used to keep the perpendicular lines rectilinear. A long-focus lens and long-bellows camera are necessary for this work.

Where much silver or glassware is to be handled a stand with movable shelves is a necessity, and the shelves should be held on pins so that they can be placed at different distances apart. For cut-glass the finest light is a strong top light. This will give brilliance to the facets and liven up what would otherwise be dull. In some factories the pieces are dipped in whiting tinted a light gray before photographing. These shelves will do for silverware, which should be photographed before receiving its polish; but this can seldom be done away from the factory. A good method for dulling bright spots is to rub the place with beeswax and then polish with the hand. This is a simple remedy and can be done easily and quickly with a little practice.

When flat surfaces have inscriptions that do not show, it is a good plan to rub into the engraving a black powder which jewelers use in their work. It will usually stick sufficiently well not to need anything mixed with it. When prints are to be made from negatives of colored subjects and the darker colors are too thin in the negative, those parts of the negative can be tinted with blue anilin, but it is very skilful work. The color is, of course, applied on the glass side. This dodge is old to most portrait workers, and enters largely into the retouching of commercial negatives of solid articles, such as metal ornaments and the like.

This is a most unsatisfactory class of **Legal Work** work, for several reasons. One never knows when he will be called upon to go into court to testify, nor how much time will be consumed, so it is difficult to fix on a price that will justify. I have made a great many negatives for this class of work. A correct record should be kept of each

exposure, showing the position of the camera, the exact locality of the place, if outdoors, and the direction in which the lens was pointing. These details should be lettered in the negative, thus: "Looking N.E. at S.W. corner Sixth and Locust streets, K. C., Mo. Camera located fifty feet from lamp-post on S.W. corner (or, at S.W. corner). Taken January 15, 1903, by ———." Do not make a print from any legal negative until such data is shown, so as not to burden your mind with remembering these circumstances; lawyers will usually accept such wording and waive a personal appearance in court. It is well not to remember anything except what the negatives show; it will save embarrassment in cross-questioning. Records of these exposures in legal work should be kept in a separate book for easy reference. Charge double the usual prices for this class of work as compared with ordinary negatives. If allowed witness fees, it usually takes more time to collect them than they are worth, so that it is unwise to figure on anything except the price of the negatives and so many prints. One set of prints should have muslin back and top for insertion in the "pleadings."

Copying Documents Another class of work requiring great skill is the photographing of indistinct and illegible documents. I recall a case of this sort which took me several hundred miles from home, and the work consisted in photographing two pages of a letter-press copy-book. The copies were in very faint blue typewriter ink on a manila-colored tissue. The work had to be done in the private chambers of the judge before whom the case had come, and I had to make use of what I could in the way of a copying rack. I bought a number of rubber bands and a sheet of white cardboard and put the white card under the leaf, leaving the back of the impression outward as the ink was plainer there than where it came through the paper. The rubber bands were used to hold the page flat and in contact with the cardboard. I set the book up by a window, used a color screen and orthochromatic plates to hold the blue ink, and made my exposures. These gave me reversed negatives, of course. When I arrived home 18 x 22 bromide enlargements made

from the glass side of the original negative, gave me a correct transcript in the print. With this bromide, the negative set in a window and a strong reading glass I deciphered each letter and, as I was certain of it, traced it in its proper place on the enlargement. In two or three days' time I had the document correctly figured out so that it could be plainly read. This is expert work and should command a high price.

I have done so much work in this Furniture specialty and have become so accustomed to working in all kinds of light that wherever possible I prefer to work at the factory. If I have several windows to work by, I put tissue paper over them and work with the light directly behind me. The walls and ceiling should be white. Work well back into the room and the light will be more even. Use orthochromatic plates and give full exposures, even to the point of overtiming. The lens for this work should not be less than 14 inches focus for plates 8 x 10. The camera should be fixed to look downward on the furniture, so as to give the back edge of seats and couches. Furniture is usually photographed in the "rough," or before it is polished. Generally the firm will have a catalogue to guide you in size and position.

If one is careful in placing the background and works well away from windows, properly prepared, he will seldom have to do any blocking out. Where this is necessary the opaque made by Alvord is extremely useful. It is fine-grained, very soluble, and can be used in a pen for writing on glass or paper and for lettering on the film side of a negative. Use a small butter plate into which put some of the opaque from the pot, adding water enough to thin it as thin as it will cover. This opaque dries quickly and will never "pull" when going over it a second time. Where fine angles and small parts have to be blocked out a fine-pointed soft steel pen can be used perfectly, putting the opaque on the pen with the brush. If you are working on films and wish to number them, you can do so on the celluloid side; and this is an advantage where one is not an adept at lettering backwards. One way is as easy to me as another. Never use India ink in blocking out, as it will

crack when it is dry. It is not necessary to block out the entire negative, as yellow or red cover paper can be cut out and pasted on the negative to cover the parts left from the opaquing. Some photographers make an untuned print carefully cut around the object and fit this on the negative, but it does not equal the other method. To keep your opaque from spreading on the negative and getting on the figure, use a lead-pencil, going around the subject; this gives a surface which will repel the opaque. Straight lines can be done with pen and a ruler.

Machine Shop Work In the modern machine-shop photography is considered only second in importance to the draftsman. A clever paper dealing with this application of photography in all its branches appeared in "Cassier's Magazine" some months ago, and a few quotations from that article will cover the subject better than an account of my somewhat limited experience in this line. I quote:

"As to the uses of shop photography—they comprise, to begin with, the supplying of photographs of the various products of the establishment, to serve advertising purposes. These photographs are usually made from a point of view that will most readily show the machine as a whole, substantially as it would look to an observer standing at its side or in front of it. This does not always give to an intending purchaser any idea of its construction or the arrangement of the working parts. However, it will in many cases be sufficient, though occasionally a prospective purchaser desires to be further informed regarding other points which are only obscurely shown on this general picture, and to enlighten him it may be necessary to make such other views as will explain them.

"One must anticipate what is wanted, and should photograph the machine from different points of view. Photograph the working parts, often a single part, especially if this part is a feature unique in that particular design of machine—for instance, on a planing machine the view looking down into the gearing. This will show how it is arranged and driven. Then there are the feeding devices, the cutting heads as a whole and in

detail, oiling devices in tracks, belt-shifting devices, and others, of all of which photographs would be desirable.

"In the case of a lathe, photographs would be desirable of the cone head, taken in such a way as to explain its construction and special features; of the carriage and apron, with views showing its working parts; and of the special tool block, taper attachment, or any other device for which superiority may perhaps may be claimed over a competitor's design and which it may be desired to impress upon a prospective purchaser. But there are many other things as well which may come to the mind of the intelligent and progressive shop photographer, all tending to increase the value of his department. . . .

"Again, photography can be of great use in making copies of standard drawings. These copies may be bound in book form, each book containing a complete set of working drawings of such machine. These drawings can be easily carried along by traveling selling agents, and, with the detail photographs of the machine itself, most intelligently explain the machine to be sold. Photographs thus made on 8 x 10 inch plates and blue-printed are of ample size to clearly show all lines and dimension figures, and are much easier to carry about than the large blue prints or tracings of the original drawings.

"Photography can be used to advantage also in the pattern-room in making records of patterns, especially in the case of a complicated pattern that it would be difficult to understand or to explain to the foundry man. In the case where patterns are sent to a distance to be cast, photographic records would show just how the separate pieces went together, especially if each piece in the photograph had a number marked on it corresponding to the number on the pattern piece itself. All patterns could be photographed on a small inexpensive plate, and a print from each pattern could be made a part of the pattern record. If the card index be used for a pattern record, the photograph could be pasted or printed on the back of a record card, and this would show at a glance, even to a novice, the shape

and character of the pattern itself, and would aid largely in picking out this particular pattern in the storage loft when occasion required it.

"In the foundry a photograph taken in the process of moulding a complicated piece might be of great value for future reference should the same piece be ordered again, and might be the means of saving considerable money in making the piece a second time, especially if a new man had the making of it.

"In the machine shop photography would apply equally in showing the work in its several stages, making a picture record of a complicated machine from the time the first machine was done to the final or completed machine ready for shipment. Of course, it would be desirable to do this only in cases where some special methods and appliances were used which would be of value and assistance should a similar problem arise in future work. A reference to what had been done in the past on similar work might be the means of saving much time and expense.

"On machinery there is so much light and shade that great care must be taken to light it properly. If possible, place the machine where the light comes in from the north, but not where the strongest light comes from the top. The upper part of a machine is usually made up mostly of bright work, and will be over-exposed before the lower portion, which is usually dark, painted work, has had normal exposure: therefore, it may be necessary to screen or cut off top light and reflect light into the darker parts of the machine, so as to give uniform lighting.

"I find it desirable, where there is much bright, polished work, to dull it by taking a ball of putty and tapping it over the bright work. This deadens the polish. This is necessary only where there is strong reflection. It is not desirable to have the picture too flat. Contrast makes an effective picture. Painting the castings a light color makes a very attractive picture, but the idea of a machine photograph is to give a picture which looks like the finished machine, and this is not the case where light paint is used. I find that by cutting off the top light and reflecting light into

the dark portions of the machine I get a picture which is very satisfactory.

"Reflectors can be made of frames covered with white cloth, or paper preferably, which can be placed at such angles as to throw a large amount of light upon the machine in the places where it is most needed. The foreground should be prepared by laying clean white boards on a level with the feet of the machine, extending well in front, at each end, and at the rear as far as possible, so as not to show the joining with the screen. The screen should be carried back of the machine far enough to be out of focus, and, if at all soiled, it should be kept in motion. A gentle swaying sidewise will be sufficient to make a clean background. Great care should be taken to keep this screen clean and to keep it far enough away from the machine so that no shadows are cast upon it, as this will greatly facilitate blocking out or painting out the background on the finished negative. This blocking out is necessary if a pure white background be desired.

"Usually the machine has the maker's name cast on it, as well as pattern and piece numbers. These can be prominently brought out by rubbing them over with chalk. Ordinarily, a well-exposed and developed negative requires no retouching. If, however, it should be necessary, my advice is to take it to some professional retoucher, and, at slight expense, have it done properly. This is a trade in itself, and it is cheaper to have it done than to learn the trade.

"A long-focus lens I find to be the best, as it gives better definition and less distortion than a short-focus wide-angle, especially if the machine to be photographed is long and narrow. The lens should be absolutely rectilinear, otherwise the straight lines in the machine will be curved and the whole machine distorted. Oftentimes, however, a cheap lens will give good enough definition and prove quite as satisfactory as a very expensive one. The box should be good and strong, and the tripod on which it is mounted should be heavy and rigid, so as not to vibrate or jar and so blur the picture. Stop the lens low down and expose for the shadows; develop slowly, and, if necessary, accelerate

development where it is weak. Continue development until all detail is out and there is sufficient density and contrast to give a good print.

"Do not get the plate too dense, as it makes a hard 'printer' and one that has too great contrast to be satisfactory. Regarding length of exposure, development, etc., one must be governed wholly by his own particular surroundings and conditions, the kind of plate used, the size of the stop, the time of the year, the hour of the day, and the value of light on the work."

Here our necessarily brief survey of commercial photography must end. Many branches have been left untouched, and those included have been dealt with suggestively rather than exhaustively. The photographer who takes up commercial work is presumed to possess a large measure of practical experience, and to such workers the suggestive method is the more satisfactory; the experienced photographer preferring his own methods of manipulation in all points of general practice.

BOOKS

Some subjects properly included in commercial work, such as interiors, photographing flowers and trees, copying and the like, are omitted in this monograph as having been dealt with in previous numbers, as follows: THE PHOTO-MINIATURE Series—

No. 13. *Photographing Flowers and Trees.*

No. 14. *Street Photography.*

No. 29. *Flashlight Photography.*

No. 30. *Photographing Interiors.*

No. 31. *Photographing at Night.*

No. 35. *Enlarging Negatives.*

No. 41. *Copying Methods.*

Panoramic Photography. By George E. Mellen. Price, 25 cts. The only handbook giving practical instructions in making panoramic views from several negatives by printing on a single strip of paper. Useful to commercial workers.

Notes

An index to the fourth volume of *The PHOTO-MINIATURE*, which ends with this issue, is in preparation, but unfortunately cannot be included in this number. We hope to complete it in time to bind it with the April issue, the first number of Volume V. It will, of course, be printed and folded as a separate form, so that it can be detached for binding in its proper place.



The new catalogues issued by the Rochester Optical Company, Rochester, N. Y., listing the Premo and Poco Cameras for 1903; and the new catalogue of the Century Cameras for 1903 (Century Camera Company, Rochester, N. Y.) are received as we close this number for press. A detailed account of the new cameras will appear in our April issue, but we advise interested readers to lose no time in securing these catalogues for their own perusal. Many novelties are therein announced, and the little books are full of interesting information.



The Infallible Exposure Meter Company write: We have decided to offer a first prize of a Wynne Infallible Exposure Meter in solid silver, and a second prize of a Wynne Infallible Print Meter in nickel-silver, for the best prints from negatives secured by the use of our Infallible Exposure Meter between April 15 and October 1, 1903, in each of the following classes: Landscapes—Including all outdoor work other than marines. Marines; Interiors—Including all indoor work other than portraits. Portraits. Pinholes may be spotted out, but otherwise the negatives must be printed from as they were when taken from the drying-rack. Technical

excellence only will be considered in making the awards, save in the case of a tie, when the awards will be made in the order of artistic merit. On the back of each print should appear: The actinometer time; plate used; stop employed; light conditions; time of day; exposure given, and the name and address of the competitor. If a color screen was used, the fact should be stated. Any number of prints, all preferably unmounted, may be submitted in each class. When requested, prints will be returned if accompanied with sufficient postage.



Mr. Juan C. Abel asks us to notify the trade that he is no longer connected with "Rotograph." According to later information, Mr. Abel is planning the publication of a photographic weekly, which is to appear at an early date.



Folmer & Schwing Manufacturing Company, 407 Broome street, New York, have sent us particulars and sketches of a new copying stand which promises great usefulness in commercial and scientific work. We had hoped to present an illustrated description of the stand in this number, but must defer the note for a later opportunity. Those having use for such a stand should write the manufacturers for particulars.



The April number of *Camera Craft* (San Francisco) will be a special issue devoted to a résumé of photography as an industry, with illustrated articles by the principal photographic manufacturers in addition to the regular features of the magazine.



The Chicago Society of Amateur Photographers held its annual reception a few evenings ago at the Art Institute, when several hundred friends of the Society gathered together to celebrate its twentieth anniversary. A concert and exhibition formed features of the entertainment, which closed with a dance. The Society has

developed a new interest during the last few years, and its membership has increased from forty to two hundred and fifty in number.



W. H. Walmsley, the veteran photo-micrographer, describes in the *Photographic Times Bulletin* for February the photo-micrographic equipment of the Pepper Clinical Laboratory of the University of Pennsylvania. The equipment includes a specially-devised electric arc light, and Mr. Walmsley's article is largely devoted to the advantages and uses of this light in photo-micrography.



The February *Photo-Era* is an unusually interesting and beautiful number. Among the notable features is an illustrated paper on "Howard Day Aiken," a photographic prodigy aged fourteen years, whose portraiture, as seen in the illustrations of our contemporary, shows much promise. The increase in the size of the *Photo-Era*, mentioned in our January issue, seems to have been insufficient for the purpose in view, as the February issue is half an inch taller. We note that after April 1 (an ominous date) the price of the *Photo-Era* is to be increased from fifteen to twenty-five cents per copy, or \$2.50 per annum. [Photo-Era Publishing Company, Boston, Philadelphia and Chicago.]



The Fifth International Congress of Applied Chemistry will begin its session in Berlin, May 31. This promises to be the most important convention of the sort yet held, and will include all branches of applied chemistry, which, of course, embraces photographic processes. The chairman of the American committee is Dr. W. H. Wiley, chief of the Bureau of Chemistry of the United States government.

Photo-chemistry is represented by Section IX, which has for its chairman Dr. Leo Baekeland. Americans interested in photo-chemistry are invited to become

members of the Congress, or to contribute papers on photo-chemical subjects. If desired, these papers can be read by contributors in person or Dr. Baekeland will present them. The fee for American members is fixed at \$4.85, and includes a full report of the proceedings of the Congress and the papers read thereat. This publication in itself will be a volume of unusual importance. All correspondence and remittances for membership should be addressed, as early as possible, to Dr. Leo Baekeland, "Snug Rock," Yonkers, N. Y.



An interesting souvenir of the Eastman Kodak competition of 1903 has reached our table in the form of a portfolio *de luxe* containing forty of the prize-winning prints and a foreword. These forty pictures are "the cream" of the eighteen thousand photographs submitted in the competition, and should be seen by all picture makers. Copies of the portfolio can be obtained by sending ten cents to the Eastman Kodak Company, Rochester, N. Y.



The Cheape Exposure Meter, referred to in our last issue, is manufactured by the Expodak Company, Charlottesville, W. Va., to whom all inquiries should be addressed.



The Cooke Portrait Lens is the latest introduction of its class in America. This objective, with an aperture of F. 4.5, is a development of the Cooke lens, and is highly esteemed by European portraitists of note. Those interested in portraiture should get the booklet from Taylor, Taylor & Hobson, Ltd., St. James Building, New York.

Postscript to No. 40 The Photo-Miniature

Under this heading will be published occasional postscripts to earlier monographs in The Photo-Miniature series, giving new or additional information.—[EDITOR]

Those readers who have had some measure of success with the formulæ for modifying the color of platinum prints by uranium toning, as published in THE PHOTO-MINIATURE No. 40, will doubtless be interested in two new methods for securing blue tones, worked out since the publication of No. 40. These methods and formulæ are sent by Mr. James H. McCorkle, and supplement his contribution to the earlier monograph. The colors they yield differ not only from each other in hue, but also from the colors obtained by the methods already published.

The use of porcelain trays in manipulation is advised as best adapted for toning purposes and most easily kept clean. Four trays will be required, not smaller than 6 x 9 inches for prints 5 x 7 or smaller. These should be plainly numbered as follows, and reserved exclusively for platinum toning methods: No. 1, for the uranium bath; No. 2, for the acid clearing bath; No. 3, for clean water; No. 4, for the bichloride of mercury bath. The first method described gives blue tones with black and white platinum prints, and these tones may be obtained either at the original development of the print or at any subsequent time. To prepare, make up a saturated solution of mercuric bichloride, as follows: Add one ounce mercuric bichloride to twenty ounces of hot water and shake until well dissolved. When ready to tone, pour enough of this solution into tray No. 4 to give a bath $\frac{3}{4}$ inch in

depth of solution, and in this immerse all the prints to be toned. Now prepare the uranium solution as follows: No. 1, uranium nitrate, 10 grains; water, 5 ounces; muriatic acid, $\frac{1}{2}$ dram. No. 2, potassium ferricyanide, 10 grains; water, 5 ounces; muriatic acid, $\frac{1}{2}$ dram. When thoroughly dissolved mix Nos. 1 and 2 and pour the solution into tray No. 1. Place a few old and worthless prints in this bath, so that the solution may work itself out somewhat. Leave the prints in the bath for about ten minutes, then remove and throw them aside as useless. Take the prints which have been soaking in the mercury solution (tray No. 4) for not less than ten minutes, and immerse them in the uranium solution (tray No. 1). Allow them to remain in this bath for about three minutes, moving them constantly. Now lift them out and pour into the uranium bath 1 ounce of the mercury solution (in tray No. 4) to every 5 ounces of developer in tray No. 1, and replace the prints in the uranium bath.

The toning will proceed slowly, being completed in from five to twenty minutes, and the depth of color obtained depends largely upon the length of time the prints were allowed to soak in the first mercury bath. When the desired color is secured, rinse for not more than two minutes in tray No. 2, containing an acid clearing bath made up by mixing muriatic acid, one-half ounce with sixty ounces of water. Finally wash the prints in two changes of clear water (tray No. 3), the time of washing not to exceed five minutes altogether.

NOTE.—When toning prints which have been soaked in the mercuric solution mentioned above, it will be found that the solution will become green in a few moments. When this has taken place it is possible to tone any black and white print to the same shade of color as those previously immersed in the mercury bath. The effect which a toning bath in this condition has upon a red-toned print is worthy of mention. Red-toned prints immersed in the bath at this stage will turn to a desirable greenish blue color, very suitable for exceptional subjects. Further, a muddy red print (and such prints are not rare) will, when toned in this bath, come out perfectly cleared of all muddiness and much

intensified. Very much the same effect can be secured by first bleaching these prints in an oxalate bath, soaking in the mercuric solution and then toning as above. The results are more satisfactory, however, when the muddy red prints are immersed directly in the mercury-uranium-ferricyanide bath, this method giving clearer whites.

When the toning bath is working satisfactorily, mix up a new bath in a separate dish, half mercuric bichloride (saturated solution) and half the regular uranium bath. When the working bath becomes weak from use add to it from this new bath a little at a time, and at each strengthening in this way add about four drops of this saturated solution of sodium sulphite. In this way a bath once working satisfactorily can be kept in order for an almost unlimited number of prints. The prints must be toned consecutively, as the bath becomes useless if allowed to stand without strengthening, and in no case should more than six or eight prints be immersed in the bath at one time.

The second method is perhaps the more interesting of the two. It combines the development and toning of the print in one operation, and is very simple. For this method a strong print is desirable and rough paper is preferable, such as Willis & Clements CC or Angelo Rough. I have obtained remarkable results with the latter brand.

To successfully develop and tone in one operation, we need to save some oxalate developer that has been used. Next prepare the uranium-ferricyanide bath as explained in the first method, and work it for ten minutes with a few discarded or worthless prints. For actual use mix old oxalate developer with this uranium bath as follows: Two parts of old oxalate developer with one part of uranium bath. Rock the tray to ensure a thorough mixing of the two solutions before use.

Taking up a strongly printed but undeveloped print, place it in this combined bath, covering it with the solution as quickly as possible, and rock the tray for a few moments. The development is much slower than is usual with black and white prints, and the sky-blue color given by this method does not at once ap-

pear. When the print is colored to the depth desired it is removed from the solution and cleared in the acid bath, already given, viz.: Muriatic acid, $\frac{1}{2}$ -ounce; water, 60 ounces. After clearing for two minutes in this bath, wash for five minutes in two changes of water as before.

If, instead of a uniform sky-blue color, we desire a print in two tones, the print is left in the developer for a longer time, when the shadows will assume a purplish brown tinge. This will deepen and extend into the half-tones and lights as the developer is allowed to continue its action, but the toning can be stopped at any desired point by simply removing the print and immersing it in the acid clearing bath.

A word of caution is needed in closing the record of these experiments. Especial care is advised in handling the mercuric solution. It is a violent poison, and when mixed with the uranium solution it produces a stain upon the hands which is very difficult to remove. The best way to remove the stain is to wash the hands thoroughly in oxalate of potash developer before the stain has had time to set. If this is neglected the stain will remain for weeks, until it has worn away. The safest and best possible method is to avoid skin trouble and stain by wearing rubber gloves when using mercury solutions.

As in all uranium-toned prints, the colors obtained by these methods are instantly removed wherever a particle of oxalate developer touches them. Care is therefore necessary in washing the hands with oxalate to avoid splashing or touching the colored prints. Another cause of spots and defects is found in the blotters used to dry colored prints. Keep a separate set of blotters for each kind of prints. This is cheaper than spoiling prints, and less aggravating. Prints which tone unevenly or are badly spotted should be placed in a tray containing oxalate developer. This will remove all the color. Clear them in an acid bath (muriatic acid, 1 ounce; water, 60 ounces); wash thoroughly; soak them in the mercury bath, and color as before in the uranium-ferricyanide bath.

There is another peculiar property possessed by all

these uranium baths. A print toned to red or blue, and then bleached in the oxalate developer, will be found, on close inspection, to be considerably intensified, and to possess detail in the shadows not observed before. If prints colored by these methods are properly cleared, and washed as directed, the colors will be reasonably permanent. They are suggested for special effects rather than for general use, and discrimination should be used in adapting the methods and their results to the different classes of subjects. Apart from the obvious advantages of a wider range of colors, made available by these toning methods, they also offer a means whereby we can turn all our prints to advantage. What with the various colors, some suited for the improvement of light prints, others for normal prints, and others again for dark, overprinted pictures, or prints on old or damp paper, I find that I can get a satisfactory print from every sheet of paper put into my printing frames. The judicious use of a trimmer is, of course, a great help in this utilizing of prints of all sorts and conditions.



According to Mr. George Hunter, in the *American Amateur Photographer*, paraffin wax mixed with oil of lavender to the consistency of ointment, forms a desirable encaustic paste for improving the surface finish of platinotypes. It is rubbed on the print with the tip of the finger and finished with an old silk handkerchief.

Books and Prints

NATURE AND THE CAMERA. How to Photograph Live Birds and their Nests; Animals, Wild and Tame; Reptiles; Insects; Fish and other Aquatic Forms; Flowers, Trees and Fungi. By A. Radclyffe Dugmore. 126 pages; 53 illustrations; $6\frac{1}{2} \times 8\frac{1}{2}$ in.; cloth. Price, \$1.35, *net*. New York: Doubleday, Page & Co.

We have read this book with the greatest pleasure. Mr. Dugmore is well known as one of the most expert of those photographers who have turned their attention to the applications of photography in "nature study." His pictures of birds, beasts and fishes have been admired by photographers and naturalists all the world over. Their publication resulted in innumerable inquiries concerning his working methods and formulæ. In the book here noticed Mr. Dugmore generously tells, with an abundance of illustration, just how he works and by what methods he secures the results which have made his name famous in the twin fields of natural history and photography. The scope of the volume is fully explained in its title; the information is given in plain language and the illustrations are charming. Every lover of nature should read the book, whether interested in photography or not.

HOW TO ATTRACT THE BIRDS, and other Talks about Bird Neighbors. By Neltje Blanchan, author of "Bird Neighbors," "Nature's Garden," etc. 224 pages; 107 illustrations; $6\frac{1}{4} \times 8\frac{1}{2}$ in.; cloth. Price, \$1.35, *net*. New York: Doubleday, Page & Co.

These intimate, suggestive and charmingly written chapters on our neighbors, the birds, need no praise for those who are acquainted with the earlier books of "Neltje Blanchan." The secrets of "making friends" with birds are delightfully told, and any one desiring

to picture the birds of town or country should not fail to avail himself of the helps here offered by one who knows. The chapters are profusely illustrated with many remarkable photographs of bird life. We regret, however, that these are printed without acknowledgment in many cases.

A PRACTICAL POCKET-BOOK OF PHOTOGRAPHY. By Dr. E. Vogel. Translated and edited by E. C. Conrad and E. M. Cobham. Second English edition from the ninth German edition. 223 pages; illustrated; $4\frac{1}{4} \times 6\frac{1}{2}$; cloth. Price, \$1.00. New York: The Macmillan Company.

Despite the magic of Dr. Vogel's name, and the numerous editions called for, we cannot recommend this book to our readers. The field it covers (all the usual photographic processes) is already covered by American text-books in which the present-day practice of photography is explained with a clearness and directness to which Dr. Vogel's *Pocket-Book*, as here translated, makes no approach. Thus the chapter on apparatus is largely unintelligible to American photographers, the terms used and information given being inept and obsolete.

FINISHING THE NEGATIVE. A handbook on all the processes between fixing and printing, with a special chapter on films. Edited by George E. Brown. 160 pages; diagrams, illustrations and index; $5\frac{1}{2} \times 8\frac{1}{2}$; cloth, \$1.25, *net*. [New York: Tennant & Ward.]

Almost every vital fact concerning the manipulation, modification or improvement of the negative from its removal from the fixing bath to putting it into the printing-frame is epitomized in this handy volume. Drying, hardening, clearing and removing stains, intensifying, reducing, softening or increasing contrasts, varnishing, stripping, retouching, hand-work, spotting and blocking-out, are the headings of the various sections. The items and formulæ in each section are numbered, and the arrangement of the book is designed to facilitate cross reference and the easy finding of any information desired. Taken altogether, "Finishing the Negative" is encyclopædic in the fullness of its infor-

mation and a model text-book in its arrangement. We commend it as the most satisfactory handbook to the branches of work indicated. The chapter on films is supplementary and tells of the modifications necessary when the methods given are applied to films.

THE SCIENCE TEACHER'S POCKET-BOOK AND DIARY, 1902-3, issued by James Woolley, Sons & Co., Ltd., Manchester, England (price, one shilling), is a useful pocket-book, providing space for memoranda and giving various useful technical tables pertaining to chemistry, electricity and allied arts. If the information given could be revised to harmonize with American methods and practice, the book would doubtless find an appreciative market in this country.

THE A B C OF PHOTO-MICROGRAPHY: A Handbook for Beginners. By W. H. Walmsley. 155 pages; 28 illustrations; 5 x 7; cloth; Price, \$1.25, *net*. New York: Tennant & Ward. London: Dawbarn and Ward Ltd. Price, in England, 5/-, postage, 4d.

Mr. Walmsley is well known as possessing a long and varied experience in this fascinating field. He has written this little book to explain—as simply as possible—the elementary principles and practice of photo-micrography. While written for beginners, it contains much information useful to more advanced workers, and is profusely illustrated with fine half-tone engravings from photo-micrographs by the author. Contents: Chapter I. Introductory. II. The Microscope and Optical Apparatus. III. The Camera and Photographic Appliances. IV. The Radiant and Illumination. V. Negative-Making. VI. Printing Methods, Lantern Slides. VII. General Notes, giving a variety of useful expedients and formulæ from the author's notebook. Description of Plates in detail. Index.

Tennant and Ward's List OF NEW BOOKS AND PUBLICATIONS

PHOTOGRAMS OF THE YEAR 1902. A Pictorial and Literary Record of the Artistic Photographic Work of the Year. Compiled by the Editors of *The Photogram*. (8th volume of the series.) The only annual record of its kind. 200 pp.; 200 illustrations. Paper, \$1. Library edition, \$1.25, postfree. Send for detailed prospectus.

AMERICAN PICTORIAL PHOTOGRAPHY. Representative examples of the work of the American School of Pictorial Photography. Selected by and reproduced in photogravure under the personal supervision of ALFRED STIEGLITZ, and formerly published by "Camera Notes." Series I, *net*, \$15. Series II, *net*, \$8. The edition was limited to 150 copies of each series, and only a few sets are obtainable. Descriptive circular on request.

THE "CAMERA NOTES" IMPROVED GLYCERINE PROCESS for the development of platinum prints, including the experiments of ALFRED STIEGLITZ and JOSEPH T. KEILEY. Illustrated with facsimile reproductions in color, by the experimenters. Reprinted from "Camera Notes." Only a few copies obtainable. Paper covers, *net*, \$1.

AN INDEX OF STANDARD PHOTOGRAMS. Being a guide for Authors, Editors and Publishers of Illustrated Books and Periodicals, Collectors of Pictures, etc., listing photographs available for publication purposes. Sold by subscription only. Particulars on request.

PHOTOGRAPHY FOR NATURALISTS. By DOUGLAS ENGLISH. A book for those interested in photographing animals, etc. 132 pp., fully illustrated. \$2.50.

PRACTICAL NOTES ON TELEPHOTOGRAPHY. By BECK LTD. A pocket-book of practical information. Cloth, 25 cents.

THE A B C OF PHOTO-MICROGRAPHY. A practical handbook for beginners, by W. H. WALMSEY. With plain instructions and many engravings. 155 pp.; 28 illustrations. Cloth, *net*, \$1.25.

PHOTOGRAPHIC APPARATUS, its making and repairing, by various English writers. 128 pp.; many diagrams. Cloth, *net*, \$1.

FINISHING THE NEGATIVE. An encyclopedic treatise on all the processes between development and printing. Edited by GEORGE E. BROWN. 160 pp.; profusely illustrated. Cloth, *net*, \$1.25.

THE LENS. A practical guide to the choice, use and testing of photographic objectives. By GEORGE E. BROWN and THOMAS BOLAS. Profusely illustrated. 176 pp. Cloth, *net*, \$1.25.

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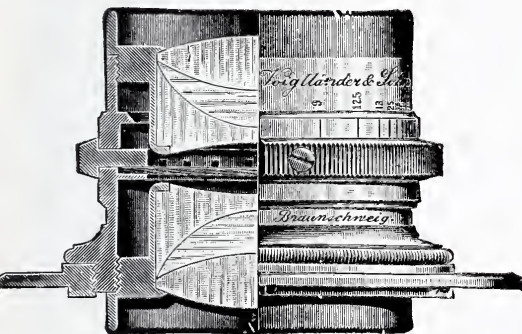
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OUR styles of cards harmonize with your good photographs. They suit the taste of the public and make secure your good prices and reputation.

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The most popular and artistic card on the market, made in eleven sizes, square and oval, hand-finished stock, matched edges, in colors,—Ascot White, Olive-brown and Fawn.

The Niagara

This is our very latest, a beauty; medallion style of pattern, linen finish, double extra heavy stock, matched edges; colors, Jet-black, Olive-brown, Venetian Brown, Cream-white and Ivory.

The Imperial

A very low-priced staple card, made of best grade of card stock; looks like a card costing double the price; colors, Olive-brown and Gray.

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Matched edges; colors, Olive-brown and Ascot White, hand-finish surface; white tissue covers to match card, and seal embossed on cover, with silk ribbon.

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CHEMICAL CO., Denver, Colo., U. S. A.

Eastman Kodak Company

ROCHESTER, N. Y.

AN INGREDIENT

EXPERIENCE MUST BE MIXED IN THE EMULSION—
OTHERWISE, FAILURE

If there is one line of business in which experience counts more than in another, that line is the manufacturing of sensitized photographic goods. And the higher the speed of the goods, the greater is the difficulty of manufacture. There is probably no legitimate business in which there have been so many monumental failures as in the photographic. Since Solio was introduced some ten years ago nearly four score photographic papers have been placed upon the market amid a blare of trumpets, have for a time attracted more or less attention and have then dropped out of sight. Attracted by the few marked successes, experimenters always seem able to induce capital to enter the field—and sink there. It is the old story of the survival of the fittest. In England, and on the continent, the photographic public has been treated to much the same sort of thing in the way of roll films that the public here has seen in the way of papers. A number of meteoric cartridges have flashed across the photographic firmament and forever disappeared. It is difficult to manufacture reliable photographic papers, but paper-making is child's play compared with the making of a reliable film.

What we know about the film business it has taken us nearly twenty years to learn. We have people connected with the manufacture of sensitized goods that have worked for us since 1880. They have learned something every year—otherwise they would not now be with us. We have built up film photography. It is a part of us and we of it. "Kodak" and "Film" and "Eastman" are names which suggest each other—they stand for the growth, the development, the perfection of an idea.

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Eastman Kodak Company

ROCHESTER, N. Y.

Kodak Film stands as the result of a score of years of work and experiment in the perfecting of that idea. It has survived the introduction of all the "superior products" which have met it at a cut price on the other side of the Atlantic. It will similarly survive here. We have a supply of experience to mix with our emulsion that others cannot get under a score of years—and by that time we shall have had two score years of such experience.

Some may say, "but you once were working without experience." True, but it was likewise with our competitors. We began at the beginning. When we commenced making dry plates they were a new product. All manufacturers of them were in the same boat with us. So it has been with the various kinds of photographic papers, except that, as a rule, we have been a few months or years ahead of our competitors. With films we were first in the field by a wide margin—our lead has been and will be maintained. We have not stood still. Five years ago we felt that we were approaching perfection in our film—but no concern, even if it could make a film as good as that was, could successfully compete for any length of time with the Eastman Film of today. Each year we mix an additional 365 grains of experience with our emulsion.

THE KODAK PORTFOLIO

A BEAUTIFUL BIT OF BOOKLET MAK-
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ROCHESTER, N. Y.

HERE'S A TEST

TWO HUNDRED AND THIRTY-NINE ROLLS DEVELOPED
IN THE KODAK DEVELOPING MACHINE

If there still exists a photographer who is skeptical as to the practical working of the Kodak Developing Machine, we especially desire to call his attention to the practical test given the machine by Mr. Theo. Rothe. When a man can use a machine on *all* the work that comes to his store and please his customers on the variety of negatives that must come in 239 hit-or-miss rolls, it's about as conclusive a bit of evidence as can be offered.

The fact is that Kodak Developing Machines have passed the experimental stage. They are correct from both the mechanical and chemical standpoints—are correct both in theory and in practice, and can be used with the same confidence in their working correctly that you have in your camera.

Considering the skepticism that they aroused and the season at which they were introduced, their sale has been little short of marvelous. When spring trade opens they are certain to have such a sale as no other bit of photographic apparatus has ever had.

DEVELOPED 239 ROLLS

Boston, January 7, 1903.

On November 1, 1902, we commenced using a Style "E" Developing Machine for *all* films brought to my store by customers for development. On December 31, we had developed 239 films, as follows:

9 Pocket Kodak,
122 Brownie (2 at a time),
76 $3\frac{1}{2} \times 3\frac{1}{2}$,
18 $3\frac{1}{4} \times 4\frac{1}{4}$,
14 4×5 .

As every customer has been pleased with the results, I conclude that such a record would be of interest to you.

Very respectfully,

THEO. ROTHE.

SEVEN SOLD

Poughkeepsie, N. Y., Jan. 3, 1903.

We wish to express our thanks to you for sending your representative here for the purpose of giving a demonstration of the merits of the Kodak Developing Machine. While he was demonstrating here we sold three of the

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YOU LIKE, USE

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ALL THE RESULTS
With Half the Trouble

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Eastman Kodak Company

ROCHESTER, N. Y.

Style E Machines and two Brownie Developing Machines. Since then we have sold two more of the Style E and have several more sales on the Style E Machines we expect to make the next few days. These are almost as good as sold now, and everyone sold we have heard from and they are giving the best of satisfaction. We are looking forward this year to doing a good business with these wonderful little machines.

Very truly yours,

CUNDY & CAIRE,

Per E. W. CUNDY.

NOTHING BUT PRAISE

Williamstown, Mass., Dec. 13, 1902.

When I received the first Kodak Developing Machine I was very skeptical as to its practical value, but I am now convinced from experience that it is all right and that you have made a great hit by getting it out. It is bound to increase the sale of Kodaks and supplies. I have sold a number of them and have heard nothing but praise from the purchasers. One of the parties was a student in Williams College, who has done some very fine amateur work. When I first showed it to him he was sure that a film covering time and snap-shots could not be developed properly. He finally took the machine, almost under protest. He has since told me that the work turned out by it beats anything he was ever able to do in the old way. Last week I demonstrated one for a gentleman from England who was visiting in our town, and he was so well pleased that when he sailed for home this week he took one with him.

Very truly yours,

P. A. CHAMBERS.

PHOTOGRAPHIC COMPETITIONS

For the benefit of those interested, we will give here, each month, a bulletin of the important photographic contests in progress throughout the United States.

BAUSCH AND LOMB OPTICAL COMPANY, Rochester, N. Y. International competition. \$3,000 in prizes. Closes October, 1903.

C. P. GOERZ OPTICAL WORKS, 52 Union Square, E., New York. Cup competition for professionals. Closes August 1, 1903.

INTERNATIONAL COMPETITION. \$1,500 cash prizes. Closes June 30, 1903.

LESLIE'S WEEKLY, 110 Fifth Avenue, New York. Weekly competitions open to amateurs. Prizes, \$10, \$5, \$1.

BUFFALO EXPRESS, Buffalo, N. Y. Continuous contest. Prizes, \$5 to \$25 weekly.

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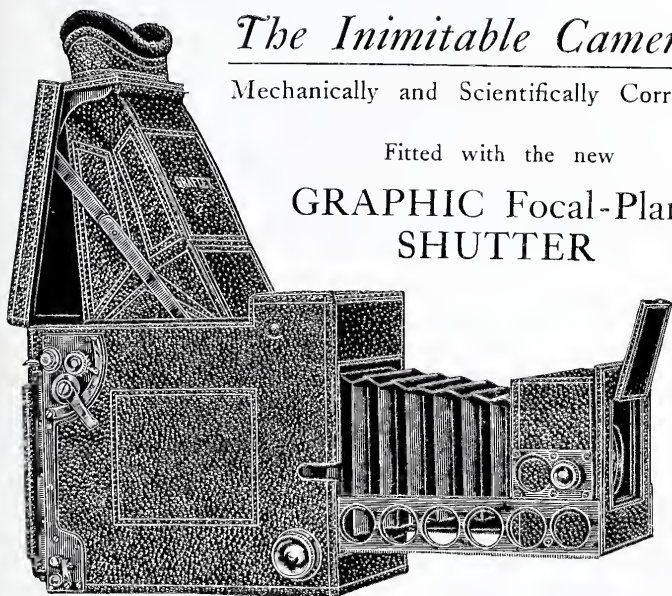
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Composed of four segments, forming two lenses in all, Homocentric Lenses in their several series are adapted to the widest range of photographic effort.

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Very truly yours,

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MY BOOK

“Colors in Photography”

tells how to make pictures by this process. It contains full directions, all necessary formulæ, a sample print made by the process, and complete instructions for manipulation. I claim for the process:

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PRINTS CONTAIN ALL COLORS OF OBJECT PHOTOGRAPHED

PRINTS WILL NOT FADE

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Insoluble emulsion—heavy
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The Perfect Photo Lens

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It is a symmetrical anastigmat of longer focus than those heretofore produced, giving superior pictorial effect. It can be fitted to any camera and takes any shutter between its combinations. The anastigmatic and other corrections are perfect, and its speed is all that is required.

The single combinations are free from astigmatism and give pictures twice the size at same distance, or same size at twice the distance, at snapshot speed.

There is no symmetrical anastigmat equal to it

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This outfit consists of one each of the following lenses: PORTRAIT, ENLARGING AND COPYING, WIDE ANGLE and TELPHOTO. Also one IDEAL RAY FILTER and one Duplicator. This outfit multiplies the value of a camera six times. The lenses are corrected and of the highest grade. *Send for pamphlet and directions for use.* Price of outfit, complete, for any size hand camera, \$6.00. The lenses can be purchased separately.



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R. O. C. The Rochester Dry Plate readily solves many of the perplexities of photography; it is the foundation of perfect picture taking; rich in the qualities that make crisp, clean, contrasty negatives.

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The New Commercial Ortho Plate

gives all the details in the yellows and allied tints. Its value in photographing

Pottery, Vases, Colored Glass Goods,
Furniture, Rugs, etc.

cannot be approached in the results given by any other plate obtainable. The shades of coloring, the grain of the wood, the special effects of finish in furnishings—all these are properly rendered by the new plate.

A clean, crisp, clear working plate, in brief, with every advantage in special color-sensitiveness.

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with the now well-known Chromatic Curve Corrector filter and all the contrasts of light and shade in the original will be rendered faithfully as the eye sees them.

Seed's New Light Filters, the Chromatic Compensator and the Chromatic Curve Corrector give absolute values

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should be used where very short exposures are necessary, and for feebly lighted subjects. Birds or animals in trees, or in shaded locations, animals in their haunts at home or abroad, all demand a plate of extreme rapidity. Our Gilt Edge 27 will respond to the quickest lens and shutter, giving an image full of detail and brilliancy.

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give new power in the development of uncertain or short exposures. More important, they give the worker control over his results. A trial of Seed's Sodas with Seed's Plates will prove this most conclusively.

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The Thornton-Pickard are probably the best shutters made in many ways; certainly they are the most widely used all over the world. They are simple, strong, reliable and the most nearly accurate made; they are cheap in point of price, rarely get out of order, and are quickly and economically repaired.

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AND
THEN WRITE FOR PARTICULARS**

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The 8x10 Cooke lens met every requirement in the way of speed and covering power that I had need of. The negatives were a surprise to me both in time and sharpness. I was so very much pleased with it that I have telegraphed to you to submit one of eighteen inches focus for use on some difficult subjects.

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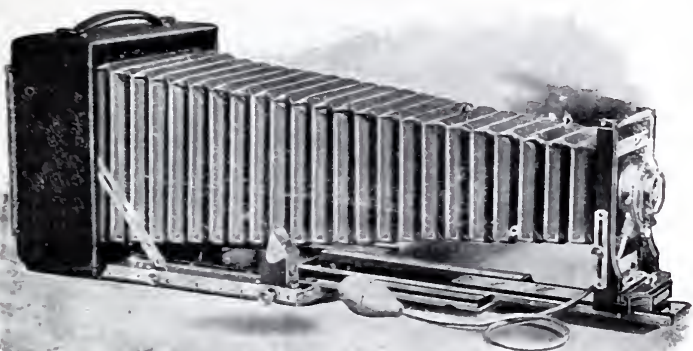
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—Clean. Will give fine,
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shadows.

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The PROSCHLITE

which is capable of doing SERIOUS and PRACTICAL WORK. It is the best flash device ever offered the amateur

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3x3x3½ in.

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100 sq. in. Flame, 5 sec.

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The New Prosch Shutter

Combines all the good qualities of the old with several new ones. Fitted with iris diaphragm. Speed from time to $\frac{1}{300}$ second.

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TURNER=REICH $f=7.5$

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REMARKABLY WIDE FIELD
COMPACTNESS OF FORM
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